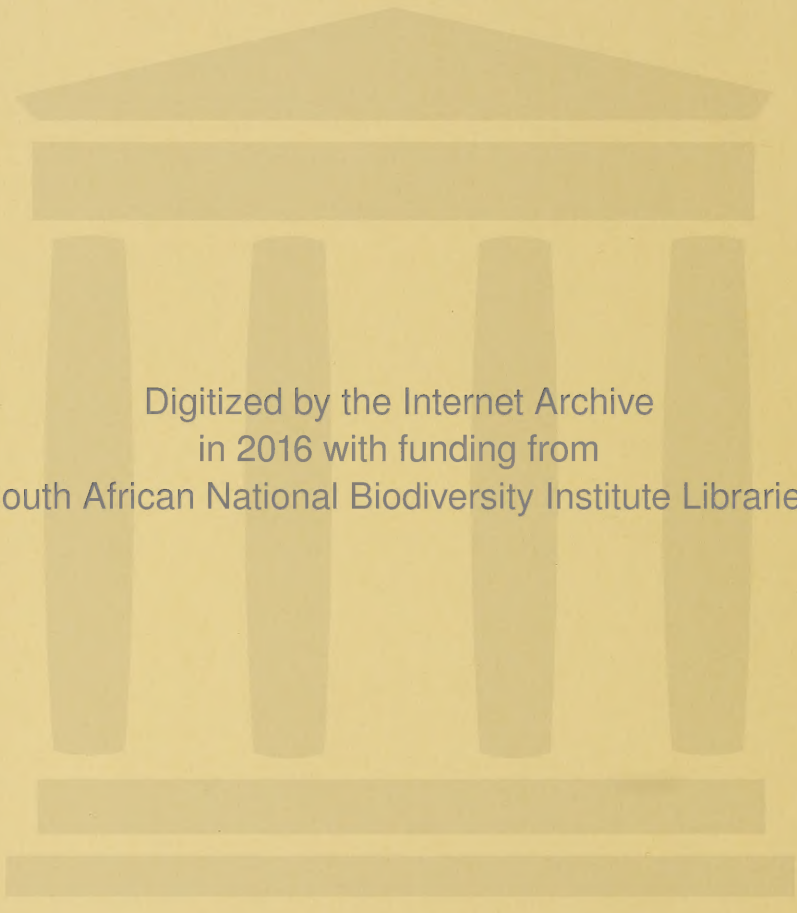

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THE SPECIES OF *ARTHROCNEMUM* AND *SALICORNIA* IN SOUTHERN AFRICA.

By C. E. Moss

(*Late Professor of Botany, University of Witwatersrand*).
(*Edited by R. S. Adamson, Professor Emeritus in the University of Cape Town.*)

Introduction.

At the time of his death the late Professor C. E. Moss had been engaged for some years on a revision of the *Salicornioideae* of Africa. He had envisaged a study of all the genera, and further had in contemplation a world revision of the genera *Salicornia* and *Arthrocnemum*. However, as his notes on extra-African species are fragmentary and clearly merely preliminary, and as the data available on the African species of the Mediterranean coasts are very far from complete, it has not been found possible to complete more than his treatment of the species of the genera *Arthrocnemum* and *Salicornia* in Southern Africa. It has seemed advisable to complete even this restricted portion as the plants form an exceedingly difficult group of which existing accounts are very far from satisfactory, and Moss himself had carried out detailed studies based largely on living or preserved (not dried) material. In the course of his work Moss had examined the collections in a number of herbaria and had attached MS names to many specimens. Some of these names have been made use of in publications.

The task of working up the notes left by Moss was at first undertaken by Mrs. Moss and myself in co-operation. For a variety of reasons, progress was exceedingly slow. After the death of Mrs. Moss, all the notes and memoranda were handed over to me, and it has at length become possible to produce this paper after an interval of over 20 years. In spite of this inordinate delay it is hoped that it will be of value in the elucidation of plants of a highly critical group and further be something

of a memorial to its author who without doubt was among the most able and critical taxonomists in S. Africa.

In its present form the paper is certainly not what its author had originally planned. Its scope has been reduced, but in the more limited field it does express his views on the species concerned and wherever possible in his own words. Some additions and alterations have been made; latin diagnoses have been added for some of the new species; the citation of synonyms has been brought into line with the recommendations of the International Code for Botanical Nomenclature (1952) and keys to the species have been added.

In parts the surviving notes had evidently been made at different times and even expressed conflicting views. Where there was no clear indication as to which was the more recent and mature point of view an editorial decision had to be made. For simplification, in the text such additions and alterations have been incorporated without any special indication.

The citation of specimens has been left as it was set out by the author except for necessary checking and the omission of a few that were marked as doubtful. No attempt has been made to incorporate recent collectings.

R. S. Adamson.

* * * * *

The original genus *Salicornia* L. has been much divided and nowadays comprises a whole subfamily. The segregation commenced in 1819 when Marschall von Bieberstein separated *Halocnemum*. C. A. Meyer in 1838 separated *Halostachys*, Moquin-Tandon in 1840 *Arthrocnemum* and *Kalidium*, Ungern-Sternberg in 1866 *Halopeplis*, and in 1876 *Heterostachys* and *Micronemum*. S. Watson in 1874 separated the American genus *Spirostachys* (=*Allenrolfea* Kuntze), Bentham and Hooker in 1880 the Australian genera *Pachycornia* and *Tecticornia*, and finally in 1902 Spegazzini separated the S. American *Halophytum*. A small residue of species remains under the original generic name *Salicornia*.

Of these twelve genera, *Halocnemum*, *Halopeplis*, *Arthrocnemum* and *Salicornia* are African and the last three S. African. There is a doubtful record of *Kalidium* for northern Africa (cf. Battandier and Trabut Fl. d'Alg. et Tun. 287. 1902).

Of the African genera *Halopeplis* is easily recognised by the alternate leaves, and *Halocnemum* by the opposite short shoots. The genera *Arthrocnemum* and *Salicornia* are much alike. Both have jointed segmented stems, the joints clothed by the fleshy leaf tissue. The separation of the two has always presented difficulties which it is hoped are now dissolved.

The characters originally ascribed to *Arthrocnemum* by Moquin-Tandon have been adopted by few subsequent botanists, and few have agreed on those which should separate the two genera. Some (e.g. Paulsen Dansk. Bot. Ark. 2·8. 62. 1918. and Chevalier Rev. Bot. App. 12. 52. 1922) have placed under *Arthrocnemum* those species with endospermous seeds and under *Salicornia* those with exendospermous seeds. This view I am unable to endorse because the change from the original conception of *Arthrocnemum* is too great and the determination of this character is very often impracticable. This last is admitted by Paulsen who, when describing new Australian species, confesses that he is not sure to which genus they belong. Finally the endosperm character has not been found to be of generic significance.

Of the two alternatives, placing all the species under *Salicornia*, or redefining the genera, I have adopted the latter. In the generic delimitation the totality of characters of the species is taken into account and the dividing line drawn where the greatest gap occurs. Moquin-Tandon attempted this, as did Bentham and Hooker, but new features have come to light since their day, and these enable the two genera to be defined satisfactorily. I claim that *Arthrocnemum* as here emended, is essentially the original genus but placed on a firm foundation.

Bentham (Fl. Austr. 5. 202. 1870) wrote:— "The species, however, require much further investigation from living plants before the value of the differences in the flowers, which are considerable, can be properly appreciated. A large proportion of the dried specimens before me are not in a state to be satisfactorily examined."

As regards the species dealt with in the present paper, I have collected nearly all of them myself and have made considerable use of fresh material preserved in alcohol or formalin. I have to thank the following correspondents for sending fresh or preserved material:— Professor R. S. Adamson, Miss L. Britten, Professor R. H. Compton, Miss A. V. Duthie, Mrs. M. R. Levyns, and Mr. N. S. Pillans. I have examined all the dried material I could obtain in S. Africa and I wish to thank the authorities of the following herbaria for giving me opportunities for studying specimens in their collections:— Bolus Herb. Cape Town; S. African Museum, Cape Town; Albany Museum Grahamstown; Natal Herb. Durban; National Herb. Pretoria; Transvaal Museum, Pretoria. Private collections have been loaned to me by Mr. H. G. Fourcade, Dr. R. Marloth, Dr. J. Muir, and the Rev. F. A. Rogers.

Especially I thank the authorities of the British Museum (Nat. Hist.) and the Kew Herbarium. For opportunities to study material in the herbaria at Berlin, Cambridge, Copenhagen, Paris, Uppsala and Vienna, I have to thank the Director of the Royal Botanic Gardens, Kew. I

have also examined the specimens in the Linnean and Smithian herbaria.

The specimens cited in my own herbarium have almost all been collected by myself and are housed in the Department of Botany, University of the Witwatersrand, Johannesburg. Duplicates of most have been sent to the British Museum and to the other herbaria mentioned.

Dried specimens of succulent plants are notoriously unsatisfactory and glassworts are no exception. If his specimens are to be of real use every collector should preserve fertile spikes in alcohol (80%) or in formalin (3—4%).

The oldest specimen of any S. African glasswort I have seen is one named "*S. herbacea*" in the Linnaean herbarium, collected at "The Cape" (probably near Cape Town) by Sparmann in the middle of the 18th century. It is barren but is probably *S. Meyeriana* Moss. The earliest published record is by Thunberg (Prod. Pl. Cap. 1. 1794) who briefly described the plant as *S. fruticosa* L. but the only specimen of any S. African glasswort in his herbarium at Uppsala is barren and indeterminable.

KEY TO THE GENERA.

1. Annual: branches all terminating in spikes: flowers protandrous: stigmas tufted .. .. *Salicornia*
1. Perennial: branches not all terminating in spikes: flowers protogynous: stigmas 2- or 3-fid. .. .. *Arthrocnemum*

ARTHROCNEMUM.

Moq. Chen. Mon. Enum. 111. 1840; D.C. Prodr. 13·2. 114. 1849: Ung.- -Sternb. Vers. Syst. Salic. 36. 1866: Atti Congr. Bot. Firen. 1874· 268. 1876: Benth. & Hook. Gen. Pl. 3·1. 65. 1860; Baker & Clarke Fl. Trop. Afr. 6·1. 85. 1909; *emend.*

Shrubs or undershrubs. Shoots erect, decumbent or prostrate, usually much branched, sometimes rooting at the nodes. Some branches barren, others terminating in spikes. Leaves smooth, glabrous, free at the tips. Spikes cylindrical or tapering. Cymules with 3—9 flowers*. Bracteoles wanting. Flowers protogynous, the central bisexual, the lateral bisexual or reduced. Perianth persistent: sepals 3 or commonly 4, almost completely united. Stamens 2, less often 1, appearing in succession. Stigmas 2, less often 3. Seed vertical, elliptical to subspherical: testa smooth or punctulate or hairy: cotyledons green, succulent, conduplicate. Endosperm starchy or wanting.

The type species is *A. fruticosum* (L.) Moq.

About 40 species on sea shores, banks of estuaries and the margins of

*F. W. Cooke (Trans. N.2. Inst. 44. 349. 1911) describes a plant (named *S. australis*) with cymules with 16 flowers in a double row.

inland salt lakes or in inland saline localities. All in the tropical and warm temperate zones.

The account of the genus given by Baker & Clarke (l.c.) does not apply to all, or even nearly all, the species and the conclusions they draw are of little value. The seeds are, in fact, of considerable help in diagnosing the generic subdivisions.

Key to the Subgenera.

1. Flowers almost or quite hidden by the edge of the segment: endosperm present .. .. *Angianthemum*
1. Flowers as long as or longer than the edge of the segment: endosperm usually wanting .. .. *Gymnanthemum*

Sub-gen. 1. **ANGIANTHEMUM** Moss s-gen. nov.

Caules decumbentes vel prostrati. Cymae triflorae, floribus segmento plus minusve omnino obscuratis. Semina laevia vel punctulata non pilosa Endosperma farinosa. Embryo lateralis.

Decumbent or prostrate undershrubs. Cymules with 3 flowers, the flowers hidden or almost hidden by the subtending segment. Seeds smooth or slightly punctulate, not hairy. Endosperm starchy. Embryo lateral. Spicular and spirally thickened cells are absent from both barren and fertile segments.

Key to the species.

1. Stout: segments of the stem not bordered: spikes cylindrical, obtuse: seed almost smooth .. .. 1. *indica*
1. Segments of the stem bordered: spikes tapering: seeds punctulate
  2. Slender: stem segments cylindrical: seeds elliptical .. .. 2. *africanum*
  2. Stout: stem segments widened upwards: seeds almost spherical .. .. 3. *affine*

1. **A. indicum** (Willd.) Moq. Chen. Mon. Enum. 113. 1840; D.C. Prodr. 13. 2. 151. 1849; Ung.-Sternb. Vers. Syst. Salic. 69. 1866; Atti Congr. Bot. Fir. 1874. 282. 1876; Hook. Fl. Brit. Ind. 5·1. 12. 1890; Cooke Fl. Pres. Bomb. 2. 3. 504. 1906; Baker & Clarke Fl. Trop. Afr. 6·1. 86. 1909 (incl. *A. fruticosum* and *A. macrostachyum*) *S. indica* Willd. Ges. Naturf. Fr. z. Berlin n.s. 2. 111. t. 4. f.2. 1799; Vahl Enum. Pl. 1. 10. 1805; Wight Icon. 3. t.737. 1834—7; *non* R. Br. *nec* Bunge.

A. macrostachyum Hiern. Cat. Pl. Afr. 1·4. 899. 1900 (p. max. pte. ex syn. omn.); *A. pachystachyum* Chev. Rev. Bot. App. 2. 52. 1922. *non* Bunge.

A robust decumbent branching undershrub. Branches glaucous-green to brown, rooting at the lower nodes. Barren segments up to 1·2 cm. long, 0·5—0·8 cm. diam., shorter and wider than those of *A. africanum* or *A. affine*, the free tips spreading in dried material. Spikes cylindrical, obtuse, with 10—16 distinct segments. Cymules 3-flowered, the flowers hidden or almost hidden by the subtending segments. Stamens 2. Stigma

2-fid. Fruiting spike cylindrical, stout, compact, smooth, brown, the old flowers almost or quite hidden: segments wider than the barren, the free tips appressed. Seeds smooth to slightly punctulate, yellow-brown, elliptical, twice as long as wide: embryo slightly curved: endosperm starchy. No spicular or spirally thickened cells in either barren or fertile segments, but numerous sclereids in the inner mesophyll just outside the endodermis and also in the free leaf tips.

The type is *Röttler* in herb. Linn.

The above description is based on my specimens from Lourenço Marques.

Africa. Senegal, (fide *Moq.* l.c.) *Perrotet* (hb. Vienna) Angola. Loanda *Gosweiler* 198; *Welwitsch* 6330, 6331 (type of *A. angolense* Welw. ex Hiern); Mossamedes *Welwitsch* 6329. Port E. Africa, Lourenço Marques *Stocks; Moss & Ottley* 3135, 3140.

Natal, Eshowe *Galpin* (19689 in Nat. Herb.)

Madagascar, *Baron* 6818: *Geay* 6054: *Junelle; Perrier* 8639, 13859; *Perrillé* 661; *Poisson* 347.

Zanzibar, *Boivin* (ann 1841); cf. *Duparquet* 1873; *Marloth* 8970.

Egypt, betn. Kosser & Ras Benas *Schweinfurth* 716.

India. Numerous localities, e.g. *Gamble* 1225; *Röttler* (type).

Ceylon. *Thwaites* 2261.

E. Indies. *Wight* 2476.

Australia. fide *Moq.* l.c.; numerous localities as *A. leiostachyum* Paulsen or *S. leiostachya* Benth.

The records given above, especially those from tropical or subtropical Africa, including Madagascar, are all additions to the previously published range of the species.

The species was originally collected by Röttler on the flats at Tranquebar, India. A specimen is preserved in the Smithiam herbarium of the Linnean Society, London. Paulsen (Dansk. Bot. Ark. 2·8. 62. 1918) reports another in the herbarium at Copenhagen. The species was first reported for Africa by Moquin-Tandon (l.c.). The doubt thrown on this record from Senegal by Chevalier is not justified.

Australian material of *A. leiostachyum* Paulsen (*S. leiostachya* Benth.) as exemplified by Osborn (10647 in herb. Moss) from Adelaide, S. Australia, is identical in all characteristics.

Bentham (l.c.) remarked that *S. indica* Willd. was insufficiently characterised. My own view is that Willdenow's description, illustration, specimens, annotations and locality taken together leave no reasonable doubt as to the identity of the species.

Chevalier (l.c.) erroneously referred the records of *A. indicum* given by Baker & Clarke (l.c.) for East Africa to *S. pachystachya* Bunge; this is discussed under the latter species. A statement by Hutchinson & Dalziel

(Fl. West Trop. Afr. 1·1. 123. 1927) that this species is "common on maritime shores of the northern hemisphere" was obviously made under some misapprehension.

2. **A. africanum** Moss Journ. S. Afr. Bot. 14. 37. 1948. *S. herbacea* auct. (e.g. Harvey Gen. S. Afr. Pl. 285. 1838 (*nomen*) *non* L. *S. natalensis* auct. (e.g. Wright Fl. Cap. 5·1. 450. 1911) *non* Bunge. *S. fruticosa* var. *capensis* Ung.-Sternb. Vers. Syst. Salic. 59. 1866.

A short-lived perennial, scarcely woody. Shoots shining, glaucous, usually gray-green or yellowish when young, fading to brownish-yellow or reddish. Main branches prostrate, the younger ascending. Barren segments up to 3 cm. long and 0·3 cm. wide, fleshy, the older cylindrical, the younger obconical, with a pale or purple rim at the top. Free tips appressed when fresh, spreading when dry. Spikes obconical, up to 6cm. long, with about 30 segments, cylindrical in fruit. Basal segments barren, 5—8 mm. long, the fertile very short, about 2 mm. Lateral spikes shorter. Cymules 3-flowered, the flowers almost or quite hidden, the central flower longer than broad, slightly longer than and completely separating the lateral. Stamens 2: anthers pale yellow. Stigmas 2. Seeds elliptical, twice as long as broad: testa punctulate. Endosperm starchy. No spiral cells occur in the palisade region of either barren or fertile segments. A very few sclereids occur in the inner mesophyll, much fewer than in *A. indicum*.

The type is *Moss* 14243.

Cape. Uitvlugt *Moss* 2691; Rugby *Moss;* Camps Bay *Burchell* 844; Raapenberg *Guthrie* 1313; *Marloth* 8145; *W-Dod* 2398; Black River *Bolus* 3708; Diep River *Pillans* 3230; Sand Vlei *Moss* 3143; *Page*; Muizenberg *Moss* 3590; *W-Dod* 976; Fishhoek *Moss* 3145, 14243 (type); Kommetje *Moss* 3590; *W-Dod* 976.

Caledon. Mossel River *Guthrie*.

Bredasdorp. Struys Bay *Levyns* 3537.

Swellendam. Slang River *Adamson*.

Mossel Bay. Gt. Brak Riv. *Moss* 4342; Little Brak Riv. *Moss* 4343.

George. Wilderness *Stephens*.

Knysna. Knysna *Duthie* 883; *Fourcade* 197, 1997a; *Krauss* 783; Plettenburg Bay *Burchell* 5310.

Bathurst. Port Alfred *Britten* 2118, 5207.

E. London. E. London *Ottley* 2568; Buffalo Riv. *Moss; Rattray* 1274; Nahoon Riv. *Galpin* 5673.

Durban. Durban *Moss* 4337; *Wood* 418.

Port E. Africa. Delagoa Bay *Wager*; Maputuland Ex. H.T.M. 14397.

A. africanum is the commonest of the species near Cape Town and

one of the commonest in the Union. On the Cape Flats it is almost an inland species and becomes locally dominant in damp depressions. *A. africanum* hybridises more commonly than any of the other S. African species.

3. **A. affine** Moss sp. nov.

A. africano affinis sed major robustiorque. Caules prostrati, ramis ascendentibus. Segmenta succulentissima, apice latiora, foliis appressis. Spicae obconicae, segmentis fertilibus 10—12, cum segmentis inferioribus sterilibus pluribus. Cymae triflorae, rarissime 4- vel 5-florae, floribus folio obscuratis. Semina ovoidea vel sphaerica, punctulata.

A low undershrub or herbaceous perennial. Shoots very fleshy, glaucous, yellowish or purplish. Primary branches prostrate, the secondary ascending, the fertile prostrate to suberect. Barren segments 3—5 cm. long, 0·8 cm. diam., widened at the top but the older almost cylindrical. Leaf tips appressed when fresh, spreading when dry. Spikes somewhat conical in flower, in fruit 5—9 cm. long. Fertile segments 10—12, about 4 mm. long, several barren segments at the base. Cymules 3-flowered, rarely 4 or 5, the barren spaces between 3—4 mm. wide. Flowers almost or quite hidden. Stamens 2; anthers cream-coloured: pollen spherical, punctulate. Stigmas 2. Seeds broadly oval or spherical, punctulate when ripe. Embryo sharply bent: endosperm starchy.

The type is *Moss* 18122.

Confined to the west coast of southern Africa, from Angola southward to Namaqualand.

Angola. Boca do Giraul *Welwitsch* 6328.

S.W. Africa. Swakopmund *Bradfield* 468; *Compton; Dinter* 262 (Fedde Rep. 343. 1918 as *A. glaucum*); *Galpin & Pearson* 7586; *Moss* 18122 (type); *Rogers*.

Union of S. Afr. Namaqualand *Pillans* 5577; *Moss* 18218, 18219; Van Rynsdorp *Moss* 18117; Clanwilliam *Pole Evans* 27, 28.

A. affine is very closely allied to *A. africanum* but is more robust and stouter in all parts. It may ultimately prove to be no more than a vigorous state of that species, the additional vigour being due to its growing in lower latitudes and consequently a hotter climate. Only experimental cultures can settle the question. The two plants look very different both when growing and also on herbarium sheets.

Sub-gen. 2. **GYMNANTHEMUM** Moss S-gen. nov.

Caules erecti vel decumbentes. Cymae 3—9-florae, floribus apparentibus, segmentorum dimidio aequantibus vel superantibus. Semina pilosa, raro punctulata. Endosperma saepius nulla.

Small shrubs or undershrubs. Cymules with 3—9 flowers, the flowers easily seen at anthesis and reaching at least half way up the segment. Seeds hairy or rarely punctulate. Endosperm wanting or very scanty.

KEY TO THE SECTIONS.

1. Cymules 3-flowered, rarely a few with 4 or 5 .. .. .. 1. *Trianthemum*
1. Cymules all or the lower with 5 or more flowers .. .. 2. *Polyanthemum*

Section 1. **TRIANTHEMUM** Moss sect. nov.

Cymae triflorae.

Cymules with 3 flowers, if rarely some with 4 or 5 most with 3.

KEY TO THE SPECIES.

1. Central flower more than half as long as the segment ..
  2. Groups of flowers laterally contiguous.
    3. Erect: spikes stout, long, cylindrical: central flower distinctly longer than the lateral .. .. .. 4. *littoreum*
    3. Sprawling or prostrate: spikes short, slender: central flower slightly longer than the lateral .. .. 8. *capense*
  2. Groups of flowers laterally separated
    4. Erect, much branched: succulent at tip only: leaf tips spreading: spikes short .. .. 5. *hottentoticum*
    4. Stems stout, succulent all along: leaf tips appressed: spikes long, cylindrical .. .. 12. *pachystachyum*
1. Central flowers not more than half as long as the segment.
  5. Flowers partly hidden .. .. 11. *natalense*
  5. Flowers well exposed.
    6. Stems rooting at the nodes, shining: spikes on main branches only .. .. 6. *perenne*
    6. Stems not rooting, often glaucous: spikes on main and lateral branches.
      7. Segments of older stems moniliform: spikes tapering: central flower slightly longer than the lateral .. .. 9. *dunense*
      7. Segments cylindrical: spikes cylindrical: central flower distinctly longer than the lateral
        8. Glaucous: leaf tips spreading when dry: seeds with conical hairs .. .. .. 7. *Pillansii*
        8. Yellowish: leaf tips appressed: seeds punctulate .. .. 10. *namaquense*

4. **A. littoreum** Moss Journ. S. Afr. Bot. 14. 38. 1948. *S. fruticosa* auct. (Harv. Gen. S. Af. Pl. 285. 1838 (*nomen*); Bolus & Wolley-Dod Trans. S. Af. Phil. Soc. 14. 3ii. 1903 (*nomen*); Wright Fl. Cap. 5·1. 449. 1911 (p. max. pte.)) *non* L. *nec aliorum.*

An erect fastigiate shrub. Stems up to 40 cm. high, 3—4 cm. diam., at the base, not rooting at the nodes. Barren segments thick, very fleshy, subglaucous, usually fading to dull yellowish-brown or rarely to dull red, 1·5—2 cm. long, 0·5 cm. diam. Leaf tips green or red, appressed when fresh, spreading when dry. Spikes thick, cylindrical, terminal on the main branches, 10 cm. long and 0·8 cm. diam., those on short subapical branches smaller. Cymules 3-flowered or rarely a few with 4 or 5 when

the outermost are sterile. Flowers contiguous when fresh, separated when dry, the central of the lowest fertile segment extending half way, of the others extending more than half way. Central flower longer than the lateral and completely separating them. Barren spaces between the cymules very small or wanting. Stamens 2: pollen spherical, punctulate. Stigmas 2. Seeds smooth when young, when mature with spreading hairs coiled at the tip. Endosperm wanting. Numerous large spirally thickened cells in both barren and fertile segments. Numerous sclereids in the inner mesophyll of both kinds.

The type is *Moss* 8775.

Namaqualand. Hondeklip Bay *Pillans* (18216, 18217 in herb Bolus)

Cape. Robben Island *Marloth;* Camps Bay *Wolley-Dod* 3056; *Marloth* 8917; *Moss* 3132, 8765, 8775 (type); *Prior; Page;* Hout Bay *Harvey* 194; Kalk Bay *Pillans* 3247.

Caledon. Mossel River *Guthrie* (17210 in herb. Bolus).

Riversdale. Kaffir Kuils River *Muir* 3149; Still Bay *Muir* 5294.

Mossel Bay. Mossel Bay *Burtt-Davy* 15639; *Moss* 4341.

Knysna. Knysna *Adamson* (8763 in herb. Moss); Plettenburg Bay *Smart* (in herb. Rogers).

Port Elizabeth. Cape Recief *Burchell* 4398; Port Elizabeth *Lurie* (18181 in herb. Moss); Walmer *E. M. Young* (17002 in herb. Moss).

The oldest known specimens were collected by Burchell at Cape Recief and by Harvey at Hout Bay. The latter were referred by their collector and also by C. H. Wright to *Salicornia fruticosa* and the plant has usually been so named by subsequent Cape botanists. *A. littoreum* differs from *A. fruticosum* (L.) Moq. in being truly erect, more robust, more fleshy ,in having fastigiate branches, larger more succulent spikes, and hairy mature seeds without endosperm. Anatomically the two species differ considerably.

The habitats and geographical distribution of the two species are totally different. The habitat of *A. littoreum* is unique among glassworts: it does not grow in salt marshes or on saline soil but in rock crevices on the sea coast or occasionally in sand. It extends into the intertidal zone and in such situations is the flowering plant growing nearest to the sea.

5. **A. hottentoticum** Moss sp. nov.

Arbusculus ramosissimus, ramis primariis compressis rigidis erecto-patentibus, ramulis subdivaricatis. Segmenta subcarnosa, viridia vel rubescentia, apicibus liberis atro-rubris etiam in vivo divaricatis. Spicae maturae cylindricae segmentis fertilibus c. 10. Cymae triflorae, flore medio lateralibus longiore. Semina pilosa pilis perbrevibus curvatis. Endosperma nulla.

An erect much branched undershrub up to 70 cm. high, forming circular or elliptical tufts up to 1·3 m. diam. Main branches compressed, erect or suberect, up to 1·5 cm. diam., at the base, brittle almost spinescent, soon losing the leaves. Secondary branches many ascending, the ultimate crowded, wide-spreading. Barren segments dull green to dull red, 0·5—0·6 cm. long, 0·2—0·3 cm. diam., not very fleshy. Free leaf tips often dark crimson, spreading when fresh, widely so when dry. Spikes tapering when young, cylindrical when mature, up to 2 cm. long, 0·3 cm. diam., with about 10 fertile segments. Cymules 3-flowered, appearing in late February, the central flower much longer than the lateral ones: barren spaces between the cymules 1 mm. wide. Pollen spherical, punctulate. Fruit ripe in May. Seeds covered with short curved hairs: endosperm wanting. Spirally thickened cells occur in the palisade of barren segments and many in the fertile. Sclereids occur in the inner mesophyll. Spicular cells are wanting.

The type is *Moss* 8874.

Malmesbury. Malmesbury *Bachmann* 1674.

Cape. Ascot *Levyns* (16968 in herb. Moss); Milnerton *Moss* 3141, 8874 (type); *Pillans* 3223, 3224; *Mund & Maire* 20.

Montagu. Montagu *Michell* (15659 in herb. Bolus); *Rogers* 15498.

Riversdale. Riversdale *Smith* 2770; Doornkraal *Muir* 3079; coast *Marloth* 3587.

This species grows in inland localities at Malmesbury, Montagu and Riversdale. The earliest specimens were collected by Mund & Maire and by Bachmann. Dr. J. Muir states that a vernacular name is "brakbossie" but this probably applies also to other halophytes.

6. **A. perenne** (Mill.) Moss Journ. S. Afr. Bot. 14. 40. 1948. *S. perennis* Mill. Gard. Dict. ed. 8. 1768.

Var. *radicans* Moss l.c.

S. fruticosa auct. (e.g. L. Fl. Ang. 1754; With. Bot. Arr. ed. 2. 3. 1787; Smith Fl. Brit. 3. 1800) *non* L. Sp. Pl. ed. 2. 5. 1762; *S. radicans* Sm. Eng. Bot. t.1691. 1807; *A. fruticosum* var. *radicans* Moq. Chen. Enum. 112. 1840; DC. Prodr. 13·1. 151. 1849; *S. fruticosa* var. *radicans* Gr. & Godr. Fl. Fr. 3. 28. 1855; *S. fruticosa* var. *paardeneilandica* Ung.-Sternb. Vers Syst. Salic. 59. 1866. (cf. incl. var. *densiflora* Ung.-Sternb. Atti Cong. Bot. Fir. 301. 1876. and var. *densiflora viridis* Ung.-Sternb. l.c. 278. f.20.) *S. sarmentosa* Duval-Jouve Bull. Bot. Soc. Fr. 15. 174. 1868; *S. perennis* var. *radicans* Moss & Salisbury Camb. Brit. Fl. 2. 188. t.195. 1914; *S. arabica* var. *paardeneilandica* Chev. Rev. Bot. App. 2. 33. 58. 1922.

A low undershrub. Shoots shining, dark green fading to brown or

yellow, much branched. Barren branches 20—30 cm. long, decumbent, rooting at the nodes: fertile branches ascending or erect. Barren segments about 1 cm. long, 0·4 cm. diam., falling on the older parts. Spikes on the main branches, not on the smaller lateral branches, 2—4 cm. long, with 10—14 fertile segments, rather stout, cylindrical. Lower fertile segments 3—4 mm. long. Cymules 3-flowered, very rarely 4 or 5. Flowers reaching a third in the lowest, three-quarters in the upper segments: central flower wholly separating and slightly longer than the lateral Anthers bilobed, one and a half times as long as wide: pollen spherical, punctulate. Stigmas rarely 3. Seeds covered with spreading conical hairs curved at the tips. Endosperm wanting. Spirally thickened cells occur in the barren segments, a few in the fertile. A few sclereids occur in the endodermis of the barren and in the inner mesophyll of the fertile segments.

Cape. Paarden Island *Drege* 221 (type of *S. fruticosa* v. *paardeneilandica*); Salt River *Moss* 3130, 8757; *Pillans* 3227; Woodstock *Moss* 8756; Noordhoek *Pillans* 3144.

Knysna. Knysna *Adamson* (8875 in herb. Moss); *Duthie* 882; *Moss* 8770 *Fourcade* 1997a.

Port Elizabeth. Port Elizabeth *E. M. Young* (17041 in herb. Moss).

Bathurst. Kowie East *Britten* 5206.

Kentani. Kei River *Flanagan* 1119; *Pegler* 648.

Durban. Durban *Drege* (*S. herbacea* a *procumbens*): *Wood* 418; *Welsh* (17211 in herb. Moss); Umbilo *Moss* 3139, 4335.

Port. East Africa Riv. Suabo *Kirk* 16.

As a plant of western Europe and N.W. Africa *A. perenne* is well known. It was first collected in southern Africa by Drège whose specimens were named without description "*S. herbacea*.? var. *procumbens*" by E. Meyer. Drège's specimens were collected in winter and those I have seen are barren. However, the characteristic rooting branches leave no doubt as to their identity. In 1866 Ungern-Sternberg (l.c.) published the following inadequate description of it under the name *S. fruticosa* var. *paardeneilandica*. "Stems long, prostrate, rooted, branches erect, for the most part herbaceous, leaf blade very short, rounded, flowers over 2·5 mm. long. Paarden Is. (*S. herbacea* a *procumbens*. *Drege* 221)". I have not seen Drège's plant from the mouth of the Gariep (Orange), the type of *S. fruticosa* var. *densiflora* Ung.-Sternb. (1866) (=*S. fruticosa* var. *densiflora viridis* Ung.-Sternb. (1876)) but from the meagre description, the name, and the figure, it may well be *A. perenne* var. *radicans*. The illustration in Marloth Fl. S. Afr. 1. 184. f.846. 1893 of a plant there named *S. natalensis* from Luderitz is probably *A. perenne* var. *radicans*.

A. africanum x perenne var. radicans Moss hybr. nov.

Habit approaching that of *A. africanum*. Shoot shining, fading to pale yellow. Branches rooting very slightly. Barren segments about 1 cm. long, 0·3—0·4 cm. diam., slightly compressed. Leaf tips appressed when fresh, more or less spreading when dry. Spikes slightly tapering, up to 5 cm. long, with about 22 fertile segments. Cymules 3-flowered, slightly exposed at anthesis: flowers reaching a quarter way up the segment. Seed (immature) smooth. Endosperm wanting.

Cape. Salt River *Moss* 8759.

7. **A. Pillansii** Moss Journ. S. Afr. Bot. 14. 38. 1948.

Undershrub either ascending to 15 cm. high or decumbent with sinuous snake-like much flattened stems 1—2 m. long and 10—15 cm. wide. Branches succulent at the tips only, glaucous. Spikes 4—6 cm. long, 0·3 cm. diam., tapering when young but cylindrical when mature, terminal on each branch, with also several subsessile spikes as side branches near the tips. Fertile segments of the longer spikes 2—2·5 mm. high. Cymules 3-flowered: barren spaces between the cymules as wide as the lateral flowers. Central flowers longer than and wholly separating the lateral, reaching half way up the segment. Pollen oval, slightly rough. Seeds as broad as long, glabrous when young, when mature clothed with stout conical hairs, spreading and not coiled at the tips. Endosperm wanting or very scanty. A few spirally thickened cells occur in both barren and fertile segments and a few sclereids in the inner mesophyll.

The type is *Moss* 8764.

Cape. Salt River *Moss* 3141: Milnerton *Adamson* 917, 2852; *Moss* 8764 (type), 9790; Lakeside *Moss* 18367.

Bredasdorp. Struys Bay *Levyns* 3535.

Mossel Bay. Gt. Brak River *L. Bolus* (18835 in herb. Bolus).

Knysna. Knysna *Duthie* 885, 885a, 885b.

Port Elizabeth. Port Elizabeth *Stephens* (18840 in herb. Moss) Redhouse *Moss* 10016.

Bathurst. Port Alfred *Britten* 1438, 2096; Kowie East *Britten* 5198, 5203.

Two habit forms occur, one, the type, ascending, the other decumbent. Neither in external morphology nor internal anatomy have any differences been noted in the shoots.

8. **A. capense** Moss Journ. S. Afr. Bot. 14. 39. 1948.

A small undershrub, the branches brittle, flowering freely. Barren branches prostrate, not or very slightly rooting at the nodes, with few side branches; fertile branches erect. Segments not very fleshy, thin, 1·4—1·6 cm. long, about 0·2 cm. diam., green or reddish, fading to brown or red. Leaf tips appressed, often remaining so when dry. Spikes

cylindrical, obtuse, up to 7 cm. long, 0·3—0·4 cm. diam. Cymules 3-flowered, the barren spaces between very small or absent. Flowers distinctly separated when dry. Central flower reaching a third way up in the lowest segment, but almost to the top in the others. Central flower slightly larger than the lateral. Seeds hairy, the hairs conical, spreading, coiled at the tips. Endosperm wanting. No spirally thickened cells occur in either barren or fertile segments but long spicular cells in the palisade of both. Sclereids are very occasional.

The type is *Moss* 11621.

Cape. Milnerton *Moss* 11621 (type); *Adamson* 847; Riet Vlei *Pillans* 3229 (barren); Uitvlugt *Wolley-Dod* 480; Raapenberg *Wolley-Dod* 2690 (barren), 3590; Noordhoek *Moss* 3133; *Pillans* 3144.

A very local species at present only found in the vicinity of Cape Town where it is rather common on the drier parts of salt marshes and on the edges of shallow lakes or marshes on the Cape Flats. In the latter localities it hybridises with *A. africanum*. Burchell, Harvey and Wallich collected this species but most of their specimens are barren and not determinable with certainty. Wolley-Dod 2690 from near Cape Town is referred by Wright (l.c.) to *S. fruticosa* var. *capensis* Ung.-Sternb., but on what grounds I do not know. The specimen is barren and should probably be referred to *A. capense*.

A. africanum x **capense** Moss hybr. nov.

Habit intermediate between the putative parents. Cymules 3-flowered, the flowers well exposed. Pollen spherical, punctulate. Seeds oval, with stout divaricate hairs curled at the tips. Endosperm wanting. Embryo sharply conduplicate. No spirally thickened or spicular cells in either barren or fertile segments. A few sclereids in the inner mesophyll of both.

Cape. Salt River *Moss* 5259, 8757; Kommetje *Moss* 8883, 11681.

9. **A. dunense** Moss sp. nov.

Arbusculus decumbens ramosissimus. Segmenta glauca moniliformia. Spica apice angustata, segmentis fertilibus c. 20. Cymae triflorae rubro-purpurascentes, flore medio lateralibus longiore, dimidio vel tertio parte segmenti aequante. Semina punctulata, matura pilosa, pilis brevibus obtusis non circinatis.

Small much branched shrublet up to 1 m. high, the older branches decumbent, the younger erect or suberect. Segments 0·5—1 cm. long, 0·3—0·5 cm. diam., pale brown, the older moniliform, constricted at both ends. Spikes 2—4 cm. long, 0·2—0·4 cm. diam., tapering, with about 20 segments. Cymules 3-flowered, the flowers reddish-purple: central flower rather longer than the lateral, reaching a third to half way up the segment. Pollen spherical, punctulate. Stigmas rarely 3. Seeds

punctulate when young, when mature with short blunt spreading not-recurved hairs. Endosperm wanting. Large and numerous spirally thickened cells occur in the palisade of both barren and fertile segments and sclereids in the inner mesophyll.

The type is *Moss* 18048.

S.W. Africa. Luderitz *Moss* 18048 (type); *Moss & Ottley* 16629, 11707; *Stöber* (11892 in herb. Marloth).

A. dunense occurs further from the sea than other species associated with it and may act as a dune-former. Flowers are produced chiefly in the summer (Jan.).

10. **A. namaquense** Moss sp. nov.

Arbusculus circa 60 cm. altus, ramis primariis erectis, secondariis suberectis saepe curvatis. Foliorum apices appressi tamen in sicco. Rami alterni tenues pallidi. Spicae terminales lateralesque rubescentes usque ad 4 cm. longae, segmentis fertilibus c. 12. Cymae triflorae, flore medio segmenti dimidio aequante lateralibus longiore. Semina distincte punctulata: endosperma nulla.

Undershrub about 60 cm. high, the main branches erect, the secondary suberect and somewhat curved. Ultimate branchlets short, often widely spreading, pale-coloured, some barren, some fertile. Barren segments up to 1 cm. long 0·2—0·3 cm. diam. The leaf tips not spreading even when dry. Spikes reddish the terminal 4 cm. or more long, 0·2—0·3 cm. diam. at the base, tapering at the tip when in flower but cylindrical in fruit, with about 12 fertile segments: lateral spikes numerous, smaller. Cymules 3-flowered, the central flower reaching half-way up the segment, longer than the lateral. Pollen spherical, punctulate. Seed strongly punctulate. Endosperm wanting. Many long spirally thickened cells in the palisade of both barren and fertile segments. Small sclereids occur in the endodermis. Pith hollow.

The type is *Moss* 17908.

Van Rhynsdorp. Salt River *Moss* 17908 (type).

Namaqualand. Wallekraal *Pillans* (18220 in herb. Bolus). Orange River Mouth *Pillans* 5587.

Species Incompletely Known.

11. **A. natalense** (Bunge) Moss comb. nov.

S. natalensis Bunge ex Ung.-Sternb. Vers. Syst. Salic. 62. 1866; Atti Congr. Bot. Fir. 1874. 292. f.11. 1876.

Shrubby. Stems creeping and rooting at the base, erect at the tip. Leaves membranous at the tips. Spikes 1·5—2 cm. long, the flowers

partly hidden. Cymules 3-flowered, the flowers broad-based, the central scarcely longer than and separating the lateral. Seeds rounded, more or less pointed at the tip, as broad as long.

This species was described from plants collected by Drège near Durban. The specimens I have seen are incomplete and unsatisfactory. The shoot is said to be low, creeping and rooting, which can only apply to *A. perenne* var. *radicans*. However the flowers are stated to show a deceptive similarity to *A. indicum*. The only species known to occur at Durban to which this applies is *A. africanum*. As both these species occur there and no others, I can only suggest that *A. natalense* is a hybrid between them.

Wright (Fl. Cap. 5·1. 450. 1912) regarded *S. natalensis* Bunge as the plant here named *A. africanum* but the non-endospermous seed of the former (cf. Ung.-Sternb. 1876 f.11) precludes the adoption of this view. In his references Ungern-Sternberg mentions a note by Lehmann (Beit. Kent. Fl. Russl. 459. 1851) which judging from the brief description of the seed was not *A. africanum*.

12. **A. pachystachyum** (Bunge) Moss comb. nov. *non* Chev. *S. pachystachya* Bunge ex Ung.-Sternb. Vers. Syst. Salic. 51. 1866 *non* Black.

Perennial. Branches up to 5 cm. long and about 0·5 cm. thick. Middle internodes 0·2 cm. diam. Spikes cylindrical, thick, 4—6 cm. long. Cymules 3-flowered: flowers well exposed, a little broader than long: central flower reaching at least half-way up the segment ($\frac{1}{2}$—$\frac{3}{4}$), the lateral smaller. Seeds long-oval, widest near the rounded posterior end, the anterior tapering to an obtuse tip: testa gray-brown-yellow with a blueish shimmer.

Madagascar. *Boivin* 2370 (type) in Herb. Paris.

Only known from the type specimen. On the same sheet in the Paris herbarium is another specimen. *Perrillé* 661, also from Madagascar which is *A. indicum*. There is no doubt that Chevalier (Rev. Bot. App. 2. 52. 1922) has confused these two and treated them as one species. As the other specimens quoted by Chevalier also belong to *A. indicum* it is evident that the name *A. pachystachyum* Chev. is a synonym of *A. indicum*.

Section 2. **POLYANTHEMUM** Moss sect. nov.

Cymae omnes vel inferiores plurifloræ, 4—9. Semina pilosa. Endosperma nulla.

All or the lower cymules of each spike with more than 3 flowers. Seeds hairy. Endosperm wanting.

KEY TO THE SPECIES.

1. Segments of the spike dumb-bell shaped: cymules at the base 5-flowered, above 3-flowered .. .. 13. *variiflorum*
1. Segments of the spike cylindrical: cymules mostly with 5 or more flowers.
   2. Cymules with 7—9 flowers: flowers almost equal .. 14. *heptiflorum*
   2. Cymules 5-, rarely 7-flowered; the uppermost 5-, 4- or 3-flowered: central flower longer than the lateral .. 15. *australasicum*

13. **A. variiflorum** Moss Journ. S. Afr. Bot. 14. 39. 1948.

Undershrub with procumbent shoots up to 45 cm. long, and smaller suberect branches some of which are fertile. Segments up to 1 cm. long, brown, cork-like. Leaf tips scarcely divaricate even when dry, the youngest spreading. Spikes 3—3·5 cm. long, 3—5 mm. diam., tapering when young but cylindrical when mature, obtuse: fertile segments swollen and dumb-bell-shaped. Cymules with 3—5 flowers, those at the base with 5, the upper with 3. 5-flowered cymules contiguous, 3-flowered separate, the basal fertile segment with one cymule only. Central flower extending at least two-thirds up the segment, only half way in the lowest segment, longer than and completely separating the lateral flowers. Pollen spherical, smooth or slightly rough. Stigmas sometimes 3. Seeds oblong-elliptical, brown, the hairs conical, spreading, coiled at the tip. Embryo relatively large. A very few long narrow spirally thickened and spicular cells occur in the fertile segments. Sclereids occur in the inner mesophyll of the barren segments but not elsewhere.

The type is *Moss* 8765.

Cape. Milnerton *Adamson* 928, 2853; *Levyns*; *Moss* 8765 (type), 8776; Riversdale. Still Bay *Muir* 166.

Knysna. Knysna *Adamson* (9937 in herb. Moss); *Duthie*.

A. variiflorum forms a connecting link between the sections *Polyanthemum* and *Trianthemum* and is the only species of the former to occur on the shores of the Atlantic. The species is easily distinguished from *A. heptiflorum* or *A. australasicum* by the dumb-bell-shaped fertile segments as well as by the variable number of flowers in the cymule.

A. africanum x **variiflorum** Moss hyb. nov.

Intermediate between the putative parents. Pollen grains spherical, slightly rough. Seeds minutely punctulate. No spiral or spicular cells occur, a few sclereids in the inner mesophyll of barren segments and in the inner mesophyll and stele of fertile.

Cape. Milnerton *Moss* (s.n.).

A. perenne var. **radicans** x **variiflorum** Moss hyb. nov.

Intermediate between the putative parents. Pollen grains spherical slightly rough. Seeds hairy, the hairs spreading, coiled at the tips. No

spirally thickened or spicular cells in either barren or fertile segments. A few sclereids occur in the inner mesophyll of both kinds.
Cape. Salt River *Moss* 17211; Knysna *Duthie.*

14. **A. heptiflorum** Moss nom. nov. *S. australis* Sol. ex Forst. Prodr. 88. 1786 (*nomen nudum*); *S. indica* Hook. Handb. N.Z. Fl. 233. 1864. *non.* Willd. *S. pachystachya* Black Fl. S. Austral. 2. 208. f.1. 1924. *non* Bunge ex Ung.-Sternb.

Undershrub. Shoots tall, glaucous, sometimes rooting near the base, the branches erect, suberect or trailing. Older segments brown, corky-looking, up to 2 cm. long and 0·4 cm. diam., the joints not conspicuous, the leaf tips appressed, but the younger segments more obviously jointed and the leaf tips spreading when dry. Spikes stout, cylindrical, 4—7 cm. long, 0·5—0·8 cm. wide when mature, with 15—18 fertile segments, the upper close, the lower well separated. Cymules with 7, sometimes 9 flowers: flowers well exposed, conical, contiguous when fresh, almost equal in height. Barren spaces between the cymules almost wanting. Seeds broadly ovate, slightly longer than broad, hairy, the hairs spreading not coiled at the tip, blunter than those in *A. australasicum.* A few spirally thickened cells occur in the palisade of the fertile segments not elsewhere. A few sclereids occur in the inner mesophyll of both barren and fertile segments.

The type is *Forster* (from N. Z.) in herb. B. M.

Union of S. Africa. Mossel Bay. Gt. Brak River *L. Bolus* (18805 in herb. Bolus); *Moss* 4344. Port Elizabeth. Sydenham *Lurie* (18112 in herb. Moss). Uitenhage. Swartkops Riv. *Zeyher* 5. Bathurst. Port Alfred *Britten* 2078: Kowie East *Britten* 5201, 5205.

Port E. Africa. Lorenço Marques *Moss & Ottley* 16966.

Australia. W. Australia. Perth *Andrews* 706, 707. S. Australia. Glenelg *Black* 8 (type of *S. pachystachya* Black *non.* Bunge. Tasmania. Circular Road *F. v. Mueller.*

New Zealand. N. Island. *Cunningham* 366; Forster (type of *S. australis* Sol.); *Kirk* 12; Auckland *Sinclair* 23.

Australian botanists, apart from Black, have included *A. heptiflorum* in *A. australasicum* (sub. nom. "*S. australis* Sol"). However, *A. heptiflorum* has larger and stouter spikes and its cymules are commonly 7 instead of 5-flowered. The anatomy of the two plants is also different.

The oldest specimen I have seen of *A. heptiflorum* is preserved in the British Museum herbarium and is the type of "*Salicornia australis* Sol. ex Forst." It was collected in New Zealand but no description was published and the name itself appears in a list of "*Plantae dubiae*". There is a vague description of the specimen, in M.S., in the interleaved copy of

Willdenow's Sp. Pl. in the British Museum. It reads:— "australis, Salicornia caule fruticoso decumbente, ramis adscendentibus articulatis, cylindricis, medio subventricosis apice connatis". Forster's specimen should not be confused with R. Brown's 3080 which is discussed under *A. australasicum*. The oldest S. African specimen I have seen is that collected by Zeyher at the mouth of the Swartkops River.

15. **A. australasicum** (Moq.) Moss comb. nov. *Salicornia indica* R. Br. Prodr. 411. 267. 1810. *non.* Willd. *Halocnemum australasicum* Moq. Chen. Mon. Enum. 100. 1840; DC. Prodr. 13·2. 149. 1849; *S. quinqueflora* Bunge ex Ung.-Sternb. Vers. Syst. Salic. 59. 1866; Atti. Congr. Bot. Fir. 1874. 302. 1876; *S. australis* auct. (Benth. Fl. Austral. 5. 205. 1870; Paulsen Dansk. Bot. Ark. 2. 64. 1918; Chev. Rev. Bot. App. 2. 54 & 62. 1922) *non* Sol. ex Forst.

Undershrub. Shoots green, decumbent with erect or suberect branches. Segments brown and cork-like when dry, 2 cm. long, 0·3 cm. diam., the free tips appressed when dry but more or less spreading on young barren branches. Spikes about 3 cm. long, rarely 4 cm., 0·3—0·4 cm. diam., with 10—15 fertile segments, denser than in *A. heptiflorum*. Cymules mostly with 5 flowers, a few with 7, many with 3 or 4. Central flower larger than the lateral, all broad based and separate, the outermost often pistillate or barren. Seeds broadly oval, one and a half times as long as broad, covered with rather long hairs coiled at the tip. A few large spirally thickened cells occur in both barren and fertile segments . No spicular cells occur. Sclereids occur in the inner mesophyll of the fertile segments.

The type is *R. Brown* 3080 in B.M.

Africa. Union S. Af. Mossel Bay. Gt. Brak River *L. Bolus* (18837 in herb. Bolus); Little Brak Riv. *Moss* 4345; Port Elizabeth. Redhouse *Paterson* 497; Uitenhage. Swartkops Riv. *Galpin* 3165; Bathurst Kowie West *Britten* 5207; Kowie East *Britten* 5199, 5208.

Port E. Africa. Lourenço Marques *Moss & Ottley* 11739; *Moss & Rogers* 4339.

E. Indies. *R. Brown* 3080 (type of *S. indica* R. Br. *non* Willd.).

Australia. Many localities, usually as "*S. australis* Sol." e.g. *Andrews* 707; *Tilden* 816.

New Zealand. *Cunningham* 366; *Kirk* 12; *Tilden* 197.

New Caledonia. *Compton* 99.

Hitherto this species has been recorded only from Australasia and the East Indies. Its occurrence in Portugese East Africa and in the Union of S. Africa, now published for the first time, marks an extension of its range. It may in future be found in Natal, Madagascar and some of the islands of the Indian Ocean.

In the past the species has usually been named "*S. australis* Sol." or *S. quinqueflora* Bunge. As already mentioned the name *S. australis* is a *nomen nudum* and its type must be referred to *A. heptiflorum*. The name *S. australis* was first published in 1870, and although the present species comprises the major part of that, the name is antedated by *S. quinqueflora* Bunge (1866) and by *Halocnemum australasicum* Moq. (1840). Bentham & Hooker (Gen. Pl. 3·1. 65. 1860) state that "*Halocnemum australasicum* Moq. est *Salicornia quinqueflora* Bunge".

The oldest and type specimen is *R. Brown* 3080 in herb. B.M. and was named by its collector *S. indica*. There is a M.S. description in the interleaved copy of Willdenow's Sp. Pl. which is repeated in the Prodromus. The reference of the plant to *S. indica* Willd. is an error. The specimen is certainly *Halocnemum australasicum* Moq. R. Brown's specimen was collected during the voyage of H.M.S. Investigator (cf. Journ. Bot. 14. 192. 1876).

SALICORNIA.

L. Sp. Pl. 3. 1753; Gen. Pl. ed. 5. 4. 1754. *emend. S.* sub-gen. *Eusalicornia* Gren. & Godr. FL. Fr. 3. 27. 1855. (*emend*). *S.* sect. *Vulgata* Ung.-Sternb. Vers. Syst. Salic. 43. 1866; *S.* sect. *Annuae* Duval-Jouve Bull. Soc. Bot. Fr. 15. 170. 1866; *S.* sect. *Salicorniella* Moss & Salisbury Camb. Brit. Fl. 2. 187. 1914.

Annuals, erect, decumbent or prostrate, branched, the branches not rooting and all ending in spikes. Leaf tips free. Barren segments often falling away at anthesis and usually before fruiting. Spikes slender, tapering at least when young. Cymules 3-flowered or rarely 1-flowered, the central flower pointed above and narrowed at the base the lateral more or less contiguous. Stamens 1 or 2, if 2 appearing in succession, sometimes wanting in the lateral flowers. Flowers protandrous, the stamens appearing before the stigmas. Stigma tufted, not 2 or 3-fid. Testa thin, smooth, usually covered with slender hairs, appressed and circinate at the tip. Endosperm wanting, starchy perisperm often present. Embryo conduplicate.

The type species is *S. herbacea* L.

Key to the Species.

1. Slender: segments less than 1 cm. long: spikes with about 10 segments: central flower twice as long as the lateral .. 1. *Meyeriana*
1. Stout: segments 2 cm. or more long: spikes with 20—30 segments: central flower not more than one and a half times as long as the lateral .. .. 2. *Perrieri*

1. **S. Meyeriana** Moss Journ. S. Afr. Bot. 14. 36. 1948.

Slender annual with shallow roots. Stems dark green to dark crimson,

fading to dull red, erect or decumbent, not over 10 cm. high, much branched. Young branches erect, the latter spreading, the lowest up to 15 cm. long. Segments 1 cm. long or less, 2—3 mm. diam., falling early: leaf tips appressed when fresh. Spikes on both main and lateral branches, 1—2·5 cm. long, tapering when young, cylindrical at the fruiting stage, with about 10 fertile segments. Cymules 3-flowered, the central flower apparent at anthesis, acute, obscurely 4-sided, twice as long as the lateral and almost or quite separating them, in fruit as long as the segment. Barren spaces between the flowers one and a half times as wide as a flower. Seeds elliptical, 1 mm. long, 0·5 mm. wide, covered with long appressed hairs coiled at the tip. Perisperm present but no endosperm. Spirally thickened cells occur in the palisade of both barren and fertile segments. A few small sclereid occur in the endodermis of the barren and in the inner mesophyll of the fertile.

The type is *Levyns* (16969 in herb. Moss).

Cape. Paarden Is. *Drége* 221; *Moss* 3131, 5251, 8760, 8783, 10108, 10109; *Schlechter* 254 (barren); *Levyns* (16969 (type), 18807 in herb. Moss).

Bredasdorp. Struys Bay *Levyns* 3536.

Mossel Bay. Gt. Brak Riv. *L. Bolus* (18807 in herb. Moss); Little Brak Riv. *Moss* 4346.

Knysna. Knysna *Duthie* 884, 884a, 902.

Port Elizabeth. Pt. Elizabeth *E. M. Young* (17001 in herb. Moss).

Bathurst. Kowie *Britten* 2826, 5197.

Natal. Durban. *Moss* 4336, 5252.

Madagascar. *Scott-Elliot* (s.n.).

Without exact locality:— *Sparmann*.

The oldest specimen of *S. Meyeriana* is one on the sheet numbered "2" by the late B. Daydon Jackson in the Linnean herbarium: the specimen was collected by Sparmann and is barren. This is the oldest specimen of any S. African glasswort. The next botanist to collect the plant was Drège who found it at Paarden Island near Cape Town where it is still abundant. Drège's specimens were named *S. herbacea* var. *erecta* by E. Meyer but without description. Ungern-Sternberg included these plants in his *S. herbacea*. Chevalier stated that Drège's annual plant of which the specimens are barren, appeared to constitute a new species but that fresh material was needed before such a species could be founded. The species is named in honour of E. F. W. Meyer who was the first to name S. African glassworts in anything like a critical spirit. *S. Meyeriana* is very tardy in flowering: flower buds may be observed in December but it is 2 or 3 months before they reach antheses. Of the European species it is nearest to *S. ramosissima* Woods.

2. **S, Perrieri** Chev. Rev. Bot. App. 2. 53. 1922.

Stem rather robust, erect or decumbent, up to 40 cm. high. Branches numerous, ascending when young, spreading or decumbent later. Barren segments 1·5—2 cm. long (Chevalier 4—5). Spikes tapering in flower, cylindrical in fruit, 4—8 cm. long, with 20—30 segments. Cymules 3-flowered, the central flower somewhat longer than the lateral and often separating them at maturity, extending four-fifths of the segment. Barren spaces between the cymules about as wide as a flower. Stigmas simple. Seed elliptical or ovate-elliptical, hairy, the hairs mostly appressed, a few spreading, all coiled at the tip. Endosperm wanting: perisperm present. Numerous very long spirally thickened cells occur in the palisade of both barren and fertile segments. Sclereids occur in the inner mesophyll of both kinds.

The type is *Perrier de la Bathie* 1850.

Portugese East Africa. Mozambique *Engler* (cf. Fl. Trop. Afr. 6·1. 87.) *Kirk;* Delagoa Bay *Kuntze* (cf. Rev. Gen. Pl. 3·2. 267). Lorenço Marques *Moss* 6975, 6976, 7073; *Moss & Ottley* 11742, 11743; *Moss & Rogers* 3137; Rikalta *Junod* 20174.

Madagascar. Soalala *Perrier de la Bathie* 1850 (type) Bombaloka *Perrier de la Bathie* 2354.

This species appears to be very closely allied to the south European form of *S. herbacea* L.

Acknowledgment.

Grateful thanks are due to the Publications Committee of the University of the Witwatersrand for a grant towards the printing of this paper.

WELWITSCHIA MIRABILIS HOOK. F. FROM SEED TO SEED IN THE BOTANIC GARDEN OF THE UNIVERSITY OF STELLENBOSCH, C.P.

By H. Herre.
(Curator, University Botanic Garden, Stellenbosch).
(With Plates I and II).

This famous plant is strictly protected and a landscape with some plants of it is shown on the 10/- postage stamp of South West Africa. The plants grow about 100 miles north of Swakopmund and from there along a small strip up to Angola and also in Angola. There they are not rare at all and further to the north they grow also among grass and small bushes and thus are not confined to desert-like land. It was near the border of Angola that they were first found nearly a century ago by the famous English traveller Thomas Baines in 1858. One year later the Austrian medical doctor Friedrich Welwitsch also found it there. It was named *Welwitschia mirabilis* Hook. f. in 1863 (mirabilis = wonderful, strange). To-day it is made into a family of its own: Welwitschiaceae which is placed between the Gymnospermae (coniferous plants) and the Angiospermae.

Its native name is N'tumboa, the meaning of which is unknown. The natives use the dry parts of the leaves for fire-making and the bigger stems as chairs. There is no other use reported.

No doubt this plant belongs to those which derive their moisture from the underground water and most of the plants grow therefore in old riverbeds where they can obtain it. If necessary the root may grow 20—40—60 feet long, but sometimes it is much shorter. As rains are scarce in its home, the young plants depend at first on the heavy mist which is formed regularly. Thus they are slow-growing, and old plants with stems of a diameter of 10—15 feet will be very old and may reach one thousand years and more.

More than a quarter of a century ago seeds of this famous plant were first germinated at the Botanic Garden of the University of Stellenbosch. As the seedlings immediately form a long tap-root, the seeds were sown into about three-foot long drainage pipes which were closed at one side so that only a few holes were left. The soil used was a decomposed granite mixed with a certain quantity of old leaf mould. Between a fortnight and three weeks later the seeds germinated. At first the two cotyledons appeared, followed some time later by the real leaves. By then the

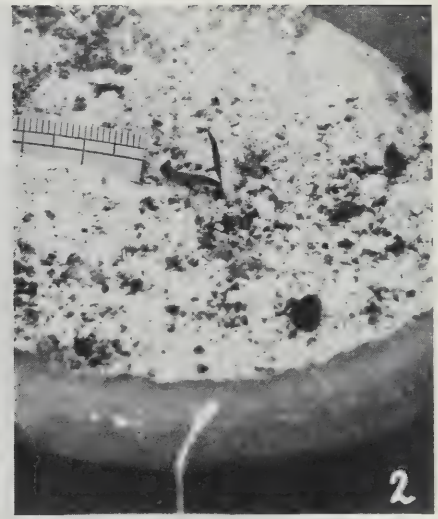
cotyledons had faded and disappeared. These leaves are the only leaves the plant ever has. They go on growing at the base throughout its life, wearing away at the tips and often becoming torn down to the base. The stem is stout, with a two-lobed form and almost circular in section. It narrows down into a stout tap-root. At the edges of the two lobes are two grooves, from each of which springs a leaf. The stem continues to grow in thickness and exhibits concentric grooves upon the top surface. In the outer (younger) of these grooves the flowers appear in dichasia of small (male) or larger (female) spikes. They are covered by bracts which become bright red after fertilization. The flowers are dioecious and are produced annually. With us it has taken 23 years to show the first (female) flower. The male plants form up to 200 small cones, each of which is about one inch long. They are ripe towards the beginning of January and show yellow stamens ripening from the base to the top of the cone until about the end of April. They also show a rudimentary gynoecium which is clearly to be seen. The female cones are much larger, about 3—4 inches long, and in Stellenbosch only about 8 cones were produced. They flower during the same period and when they are ripe for fertilizing one notices a drop of glistening fluid at the top of the hair-like stigma. In its natural habitat it is fertilized by a brown-red bug. With us we had to do it by hand. In its home the seeds ripen during May and as they are winged they are blown out and dispersed by the wind. As there is much fog at that time, the seeds will germinate immediately and by means of the long tap-root, the young plants try to reach the underground water.

With us the first cones were ripe on September 16th and 18th 1953 respectively and there were about 50 good seeds in one cone. Five of these seeds were sown on October 10th and by October 23rd the first had germinated, followed by the second one on October 26th. Hence we have now the chance to have our own seedlings fruiting in another quarter of a century.

In their natural home one will sometimes find a fungus living in the seeds which are destroyed by it, so that they fail to germinate. The seed is then filled with its black spores. Happily this fungus is not widely distributed so far and thus there appears to be no danger that it may eradicate this most interesting and unique plant.

PLATE I.

Welwitschia mirabilis Hook. f.
Female plant grown at the Botanic Garden, University of Stellenbosch, March 1953.
Photo: G. C. Crafford.



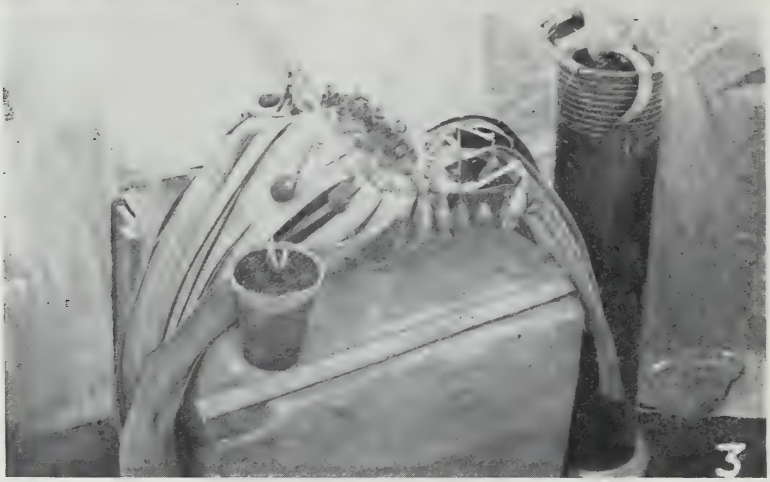


PLATE II.

Welwitschia mirabilis Hook. f.

FIG. 1. Male plant grown at the Botanic Garden, University of Stellenbosch, March 1953.
Photo: H. Herre.

FIG. 2. Seedling from Parents grown from seed in the Botanic Garden, University of Stellenbosch, November 1953.
Photo: G. C. Crafford.

FIG. 3. l. to r. Young seedling, an old plant, approximately 200 years of age, from its native habitat, and a 10-year old specimen grown in a Drainage Pipe. November 1953.
Photo: H. Herre.

TWO NEW ALOES FROM SOUTHERN ETHIOPIA.

By G. W. Reynolds.

(With Plates III and IV.)

The Coryndon Museum Expedition to Southern Ethiopia and Somalia was organised to facilitate the investigation of Euphorbia, Monadenium, succulents, and general botanical collecting by Mr. P. R. O. Bally, and for the investigation and study of the genus Aloe at recorded type localities and elsewhere in those regions, by myself. Mr. A. Money-Kyrle accompanied us on Quelea research.

Leaving Nairobi on 29th August, 1953, we travelled northwards to Isiolo, thence eastwards to Wajir and northwards to Moyale in the Northern Province of Kenya Colony, on the border of Ethiopia.

In Southern Ethiopia we journeyed to Mega, Yavello, Agere Mariam (Alghe) and Neghelli, and left Ethiopia at Dolo at the confluence of the Daua Parma and Ganale Doria Rivers.

In the Moyale-Mega-Yavello area I was fortunately able, *inter alia*, to identify *Aloe Rivae* Bak., *A. otallensis* Bak., *A. boranensis* Cufad (which proved to be a hybrid), trace an unexpected distribution of *A. secundiflora* Engler, and find two very distinctive new species. Near the Daua Parma River a third new species was found, and a form of *A.trichosantha* was seen and collected. The distribution of all species was noted.

In Somalia we journeyed from Dolo to Lugh Ferrandi and Iscia Baidoa, thence to Bardera, and down the east side of the Juba River to Gelib and Margherita, and to Kismayu. From Kismayu we proceeded up to Mogadishu, and continued northwards to Bulo Burti. Here, due to the nearness of the rainy season, and the real danger of being bogged down and cut off by the rains, it was decided to return to Nairobi. This was done via Kismayu, Beles Cogani, Liboi and Garissa, Nairobi being reached on 15th October.

During these travels, amounting to 3750 miles, a large number of Aloe habitat photographs was secured, and many herbarium specimens prepared, all of which have been contributed to the National Herbarium Pretoria, together with copies of copious field notes. Duplicates are being sent to Kew. A number of living plants was sent to Johannesburg for further study.

Notes on the identity of the Aloes of Somalia will form the subject of a separate article; the purpose of the present paper is to describe two of the new species of Aloe found in Southern Ethiopia.

A. calidophila Reynolds. Species nova in Sect. *Aethiopicae*, *A. microdonta* Chiov. et *A. eru* Berger affinis.

Planta succulenta, breviter caulescens vel caules elongati procumbentes 1—2 met. longi. *Folia* c. 20, dense rosulata, basi 16 cm. lata, sensim attenuata et usque 80 cm. longa, patentia, recurvula, profunde canaliculata, marginibus dentibus albidis 4—5 mm. longis, 20—25 mm. inter se distantibus instructa. *Inflorescentia* paniculata, 1·3 met. alta. *Pedunculus* c. 12-ramosus. *Racemi* erecti, 10—13 cm. longi, 5 cm. diametro. *Bracteae* ovato-acuminatae, 3—4 mm. longae, 2 mm. latae, scariosae, 3-nervatae. *Pedicelli* 10 mm. longi. *Perigonium* basi coccineum superne aurantiacum, cylindrico-clavatum, 22 mm. longum; *segmenta exteriora* per 11 mm. libera. *Antherae* vix exsertae. *Stigma* demum 1—2 mm. exserta. *Ovarium* 5 mm. longum, 2 mm. diametro. (Plate III.)

Eithiopia: Sidamo Province, Borana District, on the arid grassy Dida Cheena Plains, 49 miles WNW of Moyale on the road to Mega, 4400 ft., c.3° 53′N., 38° 35′E., 6 Sept. 1953, *Reynolds* 7029 (type) in National Herbarium Pretoria, with type no. in Herb. Kew.

Our new species is characterised by having large, deeply channelled, very recurved leaves, a much branched inflorescence with erect subdense racemes and clavate flowers, which are dull scarlet near base, turning orange towards the mouth.

In leaf characters, *A. calidophila* approaches *A. microdonta* Chiov. in Southern Somalia, but the latter is immediately separated by its oblique lax racemes with secund red flowers.

The clavate flowers of *A. calidophila* resemble those of *A. eru* Berger, but the latter has entirely different leaves, and a lower inflorescence with slightly shorter flowers. Another affinity, *A. magnidentata* Verdoorn et Christian, differs from *A. calidophila* in having thickened leaf margins with large thick bases to small blunt teeth, and cylindrical red or yellow flowers.

The largest numbers of plants were found on arid plains, in intensely hot places, which suggested the specific epithet.

Description. A succulent low shrub, forming small to large dense groups.

Stem short, or, in old specimens procumbent for 1 met., thence ascending for 1 met., with old dried leaf remains persistent, sometimes with shoots from base forming dense groups.

Leaves about 20, rather leathery, densely aggregated at apex of stems, basally sheathing and about 16 cm. broad when pressed flat, gradually tapering to the apex, about 80 cm. long, deeply canaliculate, spreading and much recurved with the apices usually pointing downwards;

upper surface dull olive-green, without spots or lineation; *lower surface* much rounded, of similar colour to the upper surface; *margins* armed with firm, cartilaginous, dull white teeth which are pale reddish-brown tipped, 4—5 mm. long, 20—25 mm. distant, the interspaces straight and the colour of the leaf. The sap dries deep brown.

Inflorescence a branched panicle 1—1·3 met. high.

Peduncle plano-convex and 23 mm. broad at base, terete upwards, brown, with a grey powdery bloom, branched about the middle, with about 12 arcuate-ascending branches, the lowest of which with 1—2 branchlets.

Racemes erect, slightly conico-cylindric, 10—13 cm. long, 5 cm. diam., rather densely flowered, the buds suberect, dull scarlet with grey-green tips, open flowers subpendulous, a little laxer, paler scarlet at base turning orange upwards.

Bracts ovate-acuminate, 3—4 mm. long, 2 mm. broad at base, thin, scarious, with 3 congested nerves down the middle.

Pedicels averaging 10 mm. long, curved, with apex nutant.

Perianth scarlet at base, turning orange towards the throat, 22 mm. long, cylindric-trigonous-clavate, obtusely tapering at base, cylindric and 6 mm. diam. across the ovary, thence laterally compressed-trigonous and enlarging to the throat; *outer segments* free for 11 mm., with broad pale-lemon borders in upper half, 3-nerved throughout, the apices subacute, slightly spreading; *inner segments* themselves free but dorsally adnate to the outer to the middle, much broader than the outer and with an orange keel throughout, the apices brown-edged, more obtuse and more spreading than the outer.

Filaments filiform-flattened, the 3 inner narrower and lengthening before the 3 outer.

Anthers scarcely exserted.

Style filiform, yellow, with the *stigma* at length exserted 1—2 mm.

Ovary pale olive-green, 5 mm. long, 2 mm. diam.

Distribution.

Kenya: Northern Province, 65 miles north of Wajir, 14 miles south of Buna on flat sandy plains, appears to be the southern limit; north of Buna near Korondil; near Moyale. Plants at El Wak (not seen) may belong here.

S. Ethiopia: Borana, occurs in numbers for 60 miles along the road from Moyale to Mega, especially on the Dida Cheena plains (type locality); 3—5 miles north of Mega; near Dubuluch (21 miles north of Mega) and

for 25 miles north of Dubuluch; near Yavello to 10 miles north of Yavello; in the plains 25 miles west of Yavello; occurs repeatedly for 66 miles along the Yavello—Daua Parma—Neghelli roads at altitudes from 4,800 ft. to 4,200 ft. In the last mentioned area, many plants were found in very young bud in September, which suggests that November is the usual flowering time there. Not seen east of the Daua Parma River.

A. yavellana Reynolds. Species nova in sect. *Prolongatae*, *A. rabaiensis* Rendle, affinis, sed floribus brevioribus facile distinguitur.

Planta succulenta, fruticosa; caules erecti usque 1 met., vel procumbentes et 1—3 met. longi, apice per 20 cm. foliata. *Folia* 16—20, ex vaginis striatulis, patula vel recurvula, 6—8 cm. lata, sensim attenuata et usque 40 cm. longa, cupreo-fusca, *supra* planiuscula, apicem versus subcanaliculata; *subtus* convexa, dentibus marginalibus deltoideis, pungentibus, 2—3 mm. longis, 10—15 mm. inter se distantibus armata. *Inflorescentia* paniculata, 60—90 cm. alta, ca. 8—10-ramosa. *Racemi* erecti, capitati, 2—3 cm. longi. *Bracteae* minutae, 3 mm. longae, 2 mm. latae, scariosae. *Pedicelli* 10 mm. longi. *Perigonium* atro-coccineum, cylindraceo-trigonum, 27 mm. longum; *segmenta exteriora* per 9 mm. libera. *Antherae* 1 mm. exsertae. *Stigma* demum 2 mm. exsertae. *Ovarium* 4 mm. longum, 2 mm. diametro. (Plate IV.)

Ethiopia: Sidamo Province, Borana District, 1 mile west of Yavello, ca. 4°55′N. 38°06′E., 5,600 ft., fl. 18 Sept., 1953, *Reynolds* 7063 (type) in Nat. Herb. Pretoria, with type no. in Herb. Kew; N.E. slopes of Mega Mtn., ca. 4°05′N. 38°20′E., 6,400 ft., fruiting 9 Sept., 1953, *Reynolds* 7041 (PRE.).

Our new species is allied to the six East African shrubby Aloes, *A. Dawei* Berger from Entebbe, *A. kedongensis* Reynolds from the Rift Valley, *A. ngobitensis* Reynolds from north of the Aberdares, *A. nyeriensis* Christian from between Nyeri and Nanyuki, *A. Pole-Evansii* Christian from near Kisumu, and *A. rabaiensis* from near Mombasa, but is immediately separated from them all by having bronze-brown leaves and capitate racemes with pedicels only 10 mm. long and flowers only 27 mm. in length, which are the smallest in this group. Another distinguishing character is that in *A. yavellana*, the dark scarlet buds are grey-striped in upper third, and are minutely white-flecked throughout. With its capitate racemes, *A. rabaiensis* is its nearest ally, but differs in having different leaves, and longer pedicels and flowers. The remaining five species all have longer racemes and longer pedicels and flowers.

A. yavellana occurs in numbers for a mile or more along north-eastern slopes of Mega mountain, in forest, in clearings, or on rocks, in places very

difficult to find. The species was therefore named after a locality where it can easily be seen from the "road".

Another peculiarity of *A. yavellana* is that it forms fairly compact shrubs when stems are erect and not exceeding 1 met. in length, but with development, stems topple over and form sprawling shrubs with stems 2—3 met. long, especially on steep slopes, with the foliate portion ascending.

Description. *Plant* succulent, a shrub with erect or sprawling stems.

Stems 3—4 cm. diam. erect up to 1 met., then falling, and sprawling and 2—3 met. and more long, branching from the base, with the apical 20 cm. ascending and subdensely foliate.

Leaves about 16—20, basally sheathing with the visible portion of sheaths striate, ensiform, spreading to suberect with the apical third recurved, 6—8 cm. broad at base, gradually attenuate, up to 40 cm. long, about 5 mm. thick; *upper surface* bronze-brown in the sun, paler in the shade, usually without markings, flat near base, slightly canaliculate towards apex; *lower surface* rounded, paler bronze-brown to dull brownish-green, rather clearly green-lineate near base, more obscurely lineate upwards, not spotted; *margins* sinuate-dentate, armed with pungent deltoid teeth which are pale reddish-brown tipped, 2—3 mm. long, more crowded near base (5—8 mm.), more distant (10—15 mm.) upwards, obsolescent near apex, the interspaces rounded and the colour of the leaf. *Sap* dries yellow-orange.

Inflorescence a branched panicle 60—90 cm. high.

Peduncle plano-convex and 12—15 mm. broad at base, terete upwards, branched about the middle, with 8—10 slender branches, the lowest with 2—3 branchlets high up, branches compact to arcuate-ascending.

Racemes erect, capitate or almost so, rounded at apex, the pedicellate part 2—3 cm. long, the buds suberect, dark scarlet, clearly minutely white-flecked throughout and with grey stripes longitudinally in upper third, open flowers cernuous to subpendulous, scarcely white-flecked.

Bracts minute, deltoid, 3 mm. long, 2 mm. broad at base, thin, scarious, reflexed, with 3 congested nerves sometimes appearing as 1-nerved.

Pedicles 10 mm. long, the colour of the buds.

Perianth 27 mm. long, cylindric-trigonous, dull scarlet at base, paler to orange upwards, basally obtusely tapering into the pedical, cylindric and 5—6 mm. diam. across the ovary, thence trigonous and narrowing on the underside, with the mouth very slightly upturned; *outer segments* free for 9 mm., thinner at the margins, 3-nerved, the apices acute, straight or slightly spreading; *inner segments* themselves free but dorsally adnate

to the outer for half their length, broader than the outer, with a reddish-orange keel, the apices more obtuse and more spreading than the outer.

Filaments pale orange, filiform-flattened, the 3 inner narrower and lengthening before the 3 outer, with their *anthers* in turn exserted 1 mm.

Style pale orange, with *stigma* at length exserted 2 mm.

Ovary pale brown, 4 mm. long, 2 mm. diam.

Amharic name: *Ret.*

Acknowledgments.

I desire to express my grateful thanks to the South African Council for Scientific and Industrial Research for a travelling grant which made possible my visit to Southern Ethiopia and Somalia to undertake Aloe research there; also to Mr. P. R. O. Bally, botanist at the Coryndon Museum Nairobi, for his collaboration in arranging a difficult itinerary, and for much other assistance.

Fig. 1.

Fig. 2.

Fig. 1. Plant fl. 6 September, 1953, 49 miles N.W. of Moyale, on road to Mega, Borana, S. Ethiopia. Height 2 met.

Fig. 2. Flowers 1/1, from bud to post-pollination stage.

Plate III.

Aloe calidophila Reynolds.

Fig. 1.

Fig. 2.

Fig. 1. Plants fl. 18 September, 1953, near Yavello, Borana, S. Ethiopia. Height 1·2 met.

Fig. 2. Flowers 1/1, from bud to post-pollination stage.

Plate IV.

Aloe yavellana Reynolds.

NOTES ON THE ALOES OF SOMALIA.

By G. W. Reynolds.

(With Plate V.)

Five species of Aloe have been described from Somalia. They are: *A. ambigens* Chiov., *A. microdonta* Chiov., *A. defalcata* Chiov., *A. Stefaninii* Chiov., and *A. Ellenbeckii* Berger. Of these, there are no published figures.

Four species described from elsewhere, but recorded as occurring in Somalia, are: *A. Ruspoliana* Bak., *A. Pirottae* Berger, *A. trichosantha* Berger, and *A. macrocarpa* Tod. Berger has figured leaf margins, perianths with pedicels and bracts of the first three, while Todaro figured a whole plant of *A. macrocarpa*.

From the study of descriptions, some of which are vague and incomplete, and from photographs of such type material as was available, it soon became clear that nothing short of a personal visit to cited type localities would ever enable me to solve the puzzles and establish the identity of the species, or at least to attempt it.

In company with Mr. P. R. O. Bally, botanist, Coryndon Museum Nairobi, I visited Somalia during September and October 1953, for the express purpose of investigating the Aloes. We entered Somalia from Ethiopia at Dolo and travelled to Lugh Ferrandi, Iscia Baidoa, Bardera, down the east side of the Juba River to Gelib, Margherita and Kismayu, thence up to Brava, Merca, Afgoi, Mogadishu, and as far north as Bulo Burti. We had hoped to visit Obbia and further afield, but the nearness of the rainy season, and the danger of being cut off and stranded, compelled us to turn back at Bulo Burti. Returning to Kismayu, we travelled via Beles Cogani (Somalia) to Liboi (Kenya) and to Garissa and Nairobi.

During these travels numerous habitat photographs of *Aloe spp.* were taken; many descriptions were written up on the spot, variation studied, and the distribution of the various species carefully recorded. Specimens were prepared and sent to the National Herbarium Pretoria, with duplicates for Kew, while a number of living plants were sent to Johannesburg for further study. The following is a list of the reported Somalia species, together with an opinion concerning them, and distribution as observed:

(1) **A. microdonta** Chiov. in *Plant. Nov. Ethiop.* 1: 7 (1928), in *Fl Somala* 1: 315 (1929). "Somalia Merid. Between Genale and Audegle. 7 Feb. 1924 (Puccioni et Stefanini n. 49)."

Genale and Audegle are agricultural settlements on the Webi Shebeli River, S.W. of Afgoi, the type locality being ca. 1°52′N., 44°47′E. Considerable quantities of plants fitting the description and matching photographs of the type material were found in this neighbourhood, in fact, it was eventually found that *A. microdonta* enjoyed the widest distribution, and occurred in the largest numbers, of all the Aloes seen in Somalia. It was frequently observed planted on Somali graves, and used for demarcating boundaries of fields. It also appears to be confined within the boundaries of Somalia, and was found mostly on grey limestone rubble and soil, in partial shade.

Distribution. 62, 64—67, 70—73 miles S.E. of Lugh Ferrandi; 50 miles S.W. of Iscia Baidoa; 14 miles N.E. of Bardera; repeatedly along the 200 miles southwards from Bardera to Gelib and Margherita at alt. 350 ft.—50 ft.; on the Gelib-Modun road (turn off for Brava) occurs at miles (from Gelib) 76, 80, 84, 95—102; Goluin 12 miles S.W. of Vittoria d'Africa; in considerable numbers, almost continuously from 30 miles S.W. of Afgoi up to Afgoi, the type locality being somewhere in this area; 3 miles W. and N. of Mogadishu; 7, 10—20 miles N. of Villaggio Duca d'Abruzzi (65, 68—78 miles N. of Mogadishu); 26 miles S. of Bulo Burti (116 miles N. of Mogadishu) alt. 400 ft. Probably also occurs further north-east. Trans Juba: 21, 76, 84 miles N.W. of Kismayu; at mile 89 (3 miles west of Beles Cogani Italian Customs) and at mile 117 (25 miles W. of Beles Cogani, *A. microdonta* meets and crosses with *A. rabaiensis* Rendle in large numbers. Western limit appears to be long. 41°25′E., with the southern limit about lat. 0°05′N.

Since Chiovenda described this species *Habitus ignotus*, an abridged description follows:

Stem slender, short or up to 1 met., procumbent with the apical portion foliate and ascending ,with shoots at random low down and forming small to large dense groups sometimes several metres across.

Leaves about 16, rosulate, 50—70 cm. long, 9—11 cm. broad near base when pressed flat, gradually tapering to the apex, spreading and much recurved with their apices pointing downwards; *upper surface* deeply canaliculate, dull green to olive-grey; *lower surface* rounded; *margins* armed with minute whitish teeth which are pale brown tipped, 1 mm. (rarely more) long, about 10 mm. distant, the interspaces straight and the colour of the leaf. *Sap* dries yellow.

Inflorescence a slender much branched panicle 1—1·3 met. high, with 8—12 spreading branches, the lowest with 2—4 branchlets. *Racemes* oblique, 10—15 cm. long, laxly flowered, the red flowers more or less secund. *Bracts* minute, 2—3 mm. long. *Pedicels* 5—6 mm. long. *Perianth* scarlet, cylindric-trigonous, 23 mm. long; *outer segments* free for 10 mm.

Anthers exserted 3 mm. *Stigma* exserted 5 mm. *A. microdonta* is separated from its nearest allies in the section *Aethiopicae* by its paniculate inflorescence having spreading branches with laxly flowered racemes of secund red flowers. (Plate V.)

(2) **A. Ruspoliana** Baker in *Fl. Trop. Afr.* 7: 460 (1898); Berger in *Pflanzenr.* Liliac-Aloin. 266 (1908).—"Somaliland: Ogaden, at Mil Mil and Imi, Riva 918, 9 Jan. 1893."

Mil Mil is in the Harar Province of Ethiopia, Ogaden, between Auareh (Awareh) and Dagabur (Daggah Bur), south of Hargeisa, at ca. 8°15′N., 43°55′E. Imi lies some 180 miles to the south-west. I was unable to visit Mil Mil, but from the description and photographs of the type there can be no mistaking this most distinctive species, which appears to be the second commonest Aloe found in Somalia.

A. Ruspoliana is distinguished by its *leaves* having minute marginal teeth only ½ mm. long, a paniculate *inflorescence* 1—1·3 met. high, branched above the middle with 12 and more branches, the lowest rebranched; *racemes* short, capitate, densely flowered; *pedicels* 5 mm.; *perianth* yellow, 16—20 mm. long, obtusely tapering at base, wider at mouth than at base. It usually has a short procumbent or erect stem, and forms dense groups sometimes a few metres across.

A. Ruspoliana occurs in the Ogaden, Ethiopia, and is recorded from Habr Anal, west of Obbia, in Northern Somalia. From personal observation, it occurs 6 miles S. of Bulo Burti (130 miles N. of Mogadishu) at 550 ft.; 47 miles S. of Bulo Burti; 3 miles S. of Afgoi; 43 and 28 miles N.E. of Vittoria d'Africa; at Modun, 85 miles S.W. of Merca; 120—130 miles S. of Bardera; 23 miles N.E. of Bardera; 12 miles S.W. of Iscia Baidoa; 18 miles S.E. of Lugh Ferrandi; and near Dolo.

In Kenya, *A. Ruspoliana* occurs in masses 57 miles west of Garissa, southwards to near Lugard's Falls and near Voi 95 miles inland from Mombassa, which appears to be its southern limit.

I have seen flowering plants of *A. Jex-Blakeae* Christian, from the type locality, Horr Valley east of Lake Rudolph, Kenya, and cannot separate them from *A. Ruspoliana*. Reasons are given below for sinking *A. Stefaninii* Chiov. The synonymy should now read:

A. Ruspoliana Bak. in *Fl. Trop. Afr.* 7:460 (1898); Berger in *Pflanzenr.* Liliac-Aloin 266 (1908).—*A. Stefaninii* Chiov. in *Result. Sci. Miss. Stefani.* 1: 171 (1916).—*A. Jex-Blakeae* Christian in *Journ. S.A. Bot.* 8: 176 (1942).

(3) **A. Stefaninii** Chiov. in *Result. Sci. Miss. Stefani* 1: 171 (1916).—"Somalia Merid.: near Hemin-Gurei, 22 July 1913, (Paoli n. 687)."

Heima and Gurei are wells to the east of Anole Hill (which hill is about 25 miles south of Bardera on the east side of the Juba River) on the bush-clad Agiuran plains at approx. 1,000 ft. I could find no track leading eastwards from Anole, and could not visit Heima, but I have been on the same Agiuran plains to the north, and there found many plants of *A. Ruspoliana* 25 miles north-east of Bardera. The only details of leaves given by Chiovenda are "According to the collector, similar to n. 600 *A. Ruspoliana* Baker." A photograph of the type, which is in Florence, and which comprises a dried inflorescence only, without leaves, is clearly that of *A. Ruspoliana.* The description is also that of *A. Ruspoliana* except that the flowers are described as 13—14 mm. long against the usual 16—20 mm. Flowers vary in length in different localities, also on soils and rainfall. In my view *A. Stefaninii* is a form of *A. Ruspoliana* with flowers a little shorter than usual, and should be reduced to synonymy under *A. Ruspoliana.*

(4) **A. defalcata** Chiov. in *Fl. Somala* 2: 424 (1932).—"Oltregiuba: near Uar Scek (Dr. R. Guidotti 1931 n. 64)."

Prof. Pichi-Sermolli recently wrote to the collector enquiring where Uar Scek was, and Dr. Guidotti replied that he "thinks with great uncertainty that Uar Scek is in the Oltregiuba, along the right bank of the Giuba River, between Dugiuma and Belet-Amin." Mr. E. Milne-Redhead informed me that Dugiuma was about 55 miles north of Gelib, and Belet-Amin about 23 miles south of Gelib. In September 1953, I travelled from Bardera to Dugiuma, Hele Scid and Gelib to Margherita searching for plants fitting the description of *A. defalcata.* I found considerable quantities of *A. microdonta* with deeply channelled much recurved leaves and a paniculate inflorescence with spreading branches, laxly flowered oblique racemes of red secund flowers. I also found lesser numbers of *A. Ruspoliana* which has suberect leaves with minute teeth and an inflorescence of capitate, densely flowered racemes of yellow flowers 15—20 mm. long. In no localities could I find plants with deeply channelled "extremely arcuate deflexed" leaves, combined with short dense racemes with 15—20 mm. yellow flowers. It then became obvious that the leaves of *A. microdonta* had been mixed with the flowers of *A. Ruspoliana,* and that *A. defalcata* as described was a mixture of species, and could not be upheld.

(5) **A. ambigens** Chiov. in *Plant. Nov. Ethiop.* 1: 6—7 (1928).—"Somalia Media: Sultanate of Obbia, between Attodi and Dolobscio, 26 April 1924. Puccioni et Stefanini n. 447 (499)." I cannot trace Attodi, but Dolobscia is shown on one map as lying west of Obbia at approx. 48°15′E., 5°20′N.

Chiovenda described this species with "Habit of growth and leaves unknown," notwithstanding which he cites *A. lateritia* Engler as an affinity in the sect. *Saponariae*. Until plants at the type locality can be examined, *A. ambigens* will remain a *species non satis cognita*.

(6) **A. Ellenbeckii** Berger in Engler *Bot. Jahrb.* 36: 59 (1905), in *Pflanzenr.* Liliac-Aloin. 216 (1908).—"South Somaliland: In bush at Fereschit. Dr. Ellenbeck n.2340, 6 July 1901."

"Habit of growth unknown. Leaves erect? Scape branched it seems. A peculiar species but imperfectly known. Placed in sect. *Saponariae* on account of the shape of the perianth, leaves slender, minutely dentate, almost as in the sect. *Macrifoliae*."—Berger. This suggests that the leaves may be near those of the Cape species *A. striatula* Haw.

Fereschit was not traced on any map, and possibly, due to difficulties of pronounciation and transliteration, it was thought that Hele Scide 9 miles west of Bardera might have been the place. Ellenbeck appears to have been in Bardera on the Juba River on 2 July 1901, and his n.2340 is dated 6 July 1901, which suggests a locality not far from Bardera. On 29 Sept. 1953, I journeyed to Bardera, crossed the river and proceeded westwards to Hele Scide, searching for *A. Ellenbeckii*. The only *Aloe sp.* found in those parts was *A. Pirottae*. Nowhere along the Juba River from Dolo to the sea, and nowhere else in Somalia could I find any species which could be included in the sect. *Saponariae*. *A. Ellenbeckii* it seems, will remain a *Species non satis cognita*.

(7) **A. Pirottae** Berger in *Bot. Jahrb.* 36: 65 (1905), in *Pflanzenr.* Liliac-Aloin. 266 (1908); Chiovenda in *Result. Sci. Miss. Stefani.* 1: 171 (1916) excl. fig. 24D.—"Somaliland: Savati, River Lagonomi, on dry stony places. Riva 1682, 25 March 1893."

After travelling from Berbera and Hargeisa to Mil Mil and Imi, Riva reached the Webi Gestro, and Dolo in March 1893. He was in Dolo at least until 16 April 1893. Riva 1682 is dated 25 March 1893, which implies that "Savati, River Lagonomi" would be somewhere near Dolo.

I visited Dolo in September 1953 in the hopes of finding the type locality, but the name could not be traced on any map, while Somalis of the Desert Locust Control there, who claimed to know every inch of the country thereabouts, had never heard of Savati or a River Lagonomi, and my quest was in vain.

Chiovenda (1c.) cites Paoli n.590 from between Mansur and Availe, which is on the east side of the Juba River, south of Bardera. I passed by Mansur and found *A. Pirottae* nearby, also *A. microdonta*. Chiovenda (1c.) also lists "*Aloe* verisimiliter *Pirottae*", while tab. 24 Fig. D, is a

photo by Scasselati and Mazzocchi of "*Aloe Pirottae* Baker?" from "Mugnica on the Juba, 8 Jan. 1912". The author was Berger not Baker, while the three flowering plants figured, (held up by three Somalis), with long stems, channelled recurved leaves and oblique racemes are clearly *A. microdonta*, which is in all ways different from *A. Pirottae*.

Berger described the species "*Habitus ignotus*" but he gives a good description of leaves and inflorescence. I found *A. Pirottae* almost invariably under thorn bushes, with the inflorescence (dry in September) entangled in the branches of thorn bushes, rarely solitary, usually in groups of 3—6 plants. The following was noted:

Plants acaulescent. *Leaves* 12—16, subtrifarious in younger plants, more rosulate in adult specimens, 45—60 cm. long, 8—9 cm. broad at base, gradually narrowing to the apex, spreading and recurved, rather canaliculate; *upper surface* mostly chocolate-brown (in the dry season), copiously marked with dull lenticular spots throughout; *lower surface* rounded, paler in colour than upper surface, copiously spotted throughout; *margins* armed with deltoid whitish horny teeth which are pale brown tipped, 2—3 mm. long and 10 mm. apart near base, gradually smaller and more distant upwards, obsolescent towards apex. *Sap* dries deep brown. *Inflorescence* a slender panicle 1—1·2 met. high, with 5—9 branches from above the middle. Not flowering anywhere in September, but from dried remains: *Pedicels* 6 mm. long, *Bracts* 3—4 mm. long, 3 mm. broad, 3—5-nerved. *Racemes* laxly flowered, the terminal 12—15 cm. long, lateral 8—10 cm. long. Flowers not seen. Dehisced capsules 15 mm. long.

Distribution. 42 miles S.E. of Lugh Ferrandi, 1,000 ft.; 50 miles S.W. of Iscia Baidoa, 1,200 ft.; 9 miles N.E. of Bardera 500 ft.; 6 and 12 miles W. of Bardera, 450 ft.; on the road from Bardera southwards to Gelib, at miles 6, 12, 18, 32 (250 ft.), 65 (200 ft.); 1 mile N. of Margherita. Not seen between Gelib and Mogadishu, but recorded as occurring near Afgoi; 91 miles N. of Mogadishu on road to Bulo Burti.

(8) **A. trichosantha** Berger var. **albo-picta** Schweinf. Chiovenda records *A. trichosantha* from hills near Biobahal, north-east of Bardera, (Paoli n. 1049), but, it seems this should be referred to the var. *albo-picta*. Certain plants which I have seen at the following localities should, it seems, be referred to *A. trichosantha* var. *albo-picta*.

Somalia: 30 miles S.E. of Lugh Ferrandi, 900 ft.; on the road from Mogadishu northwards to Bulo Burti, seen at miles 68 (300 ft.); 91, and 106; abundant from 1—5 miles south of Bulo Burti, which is 132—136 miles north of Mogadishu, at 400 ft., on light grey soils. (It may be noted

here that in Southern Ethiopia, on the Yavello-Neghelli road, plants were observed 32 miles west of the Daua Parma River in some numbers at 3,250 ft., and east of that river at miles 5, 8, 10, and 21 at 2,800—3,160 ft.)

Abridged description: *Plants* acaulescent, larger when solitary, smaller when in groups from shoots from base. *Leaves* 16—18, densely rosulate, erectly spreading, lanceolate-attenuate, up to 60 cm. long, 12 cm. broad at base, 15 mm. thick in the dry season; *upper surface* flat low down, canaliculate upwards with the apical quarter twisted, brownish-olive with a grey-bluish waxy bloom, with numerous small to large pale-greenish lenticular markings, some of which reach 2—3 cm. long and 7 mm. broad at the middle; *lower surface* rounded, browner than the upper surface, heavily bloomed and with numerous lenticular markings throughout; *margins* slightly thickened, armed with 2 mm. teeth which are pungent and reddish-brown in upper half only, the base and interspaces more or less cartilaginous, 20—25 mm. apart low down, reaching 30—40 mm. apart upwards, the leaf apex rounded and dentate. *Sap* dries yellow.

The following noted from some dried-out inflorescence still standing: *Inflorescence* 1·5 met. high, rather compactly 4—6-branched from the middle or higher. *Pedicels* of dehisced capsules 8 mm., with *bracts* a little longer. Flowers not seen but indumentum on pedicels and branches still visible under a lens. Plants have been sent to Johannesburg to grow for flowers.

(9) **A. macrocarpa** Tod. (Sect. *Saponariae*—Eritrea).

Chiovenda in *Result. Sci. Miss. Stefani.* 1: 13 (1916) identified Paoli 590, from Margherita, as *A. macrocarpa*, but this appears to be wrong. I searched near Margherita, and found numbers of *A. Pirottae* which has spotted leaves, but is far from Sect. *Saponariae*. A cross of *A. microdonta* with *A. Pirottae* was seen at Margherita, the leaves of which (but not the procumbent elongate stem) could be mistaken for a species in Sect. *Saponariae*. In no part of Somalia did I find any *Aloe sp.* belonging to the Sect. *Saponariae*. *A. macrocarpa* is an Eritrean species.

Summary.

The *Aloe spp.* occurring in Southern Somalia are *A. microdonta* Chiov., *A. Ruspoliana* Bak., *A. Pirottae* Bak., and *A. trichosantha* Berger var. *albo-picta* Schweinfurth.

Regarding other species, the position appears to be as follows:

A. Stefaninii Chiov. is a form of *A. Ruspoliana* Bak., and should be reduced to synonymy.

A. defalcata Chiov. is a mixture of species and cannot be upheld.

A. ambigens Chiov. was not found in Southern Somalia.

A. Ellenbeckii Berger was not found along the Juba River, and is a *Species non satis cognita.*

A. macrocarpa Tod. is an Eritrean species, and was not found near Margherita.

Acknowledgment.

I am indebted to the South African Council for Scientific and Industrial Research for a travelling grant which made possible my researches in Somalia and Southern Ethiopia.

Fig. 1.

Fig. 2.

Fig. 3.

Plate V.

Aloe microdonta Chiov.

Fig. 1. Plant with dried dehisced capsules, near Anole, 24 miles South of Bardera, near Juba River, Somalia. Height 1·5 met.

Fig. 2. Robust form, at Margherita, Somalia. Fl. 3 October, 1953. Height 1·5 met.

Fig. 3. Flowers 1/1, from bud to post-pollination stage.

THE IDENTITY OF *ALOE RIVAE* BAK.

By G. W. Reynolds.

(With Plate VI.)

The identity of *A. Rivae* has remained doubtful since Riva collected his material in south-western Ethiopia in 1893, and this species does not appear to have been collected again since then.

The type locality is "Somaliland: Gobbo Duaya, Riva n. 1509, 16 Oct. 1893." Also included under *A. Rivae* is: "Dry places near Coromme, in the north-west Boran, Riva n. 1766, 7 Nov. 1893." Both sheets (of which I have photographs) are in Florence.

Riva left Dolo, and travelled westwards up the valley of the Daua Parma River in April 1893, and arrived at Burgi. In September he was between the Jam Jam, and from there went up to Coromme and the source of the river Sagan in which region he remained until December. Coromme lies to the south-west of Agere Mariam (Alghe) at approx. 5°30′N. 38°04′E., while Burgi is further to the south-west at approx. 5°23′N. 37°50′E., northwards of Yavello in South-western Ethiopia. Gobbo Duaya (type locality) could not be traced on any map, but from the date, 16 October 1893, it appears to be somewhere in or near the Burgi-Coromme area.

In September 1953 (with Mr. P. R. O. Bally, botanist, Coryndon Museum Nairobi) I visited Southern Ethiopia for the express purpose of investigating *A. Rivae* and other Aloe species.

I reached Agere Mariam and set off for Coromme, but was compelled to turn back owing to the indescribably bad condition of the track. Neither Missionaries nor Ethiopian Police had ever heard of Gobbo Duaya, the type locality. Fortunately I found numbers of flowering plants further south, which fit the description and compare favourably with photographs of the type material. The species can now be more fully described, and flowering specimens figured as they occur wild. The largest numbers were found at Mega, flowering in early September, on lower slopes of the British Consulate hill to the east of the old Italian Fort; also 3—5 miles north of Mega, and in lower country 10 miles south-east of Mega. Also occurs at and near Yavello, about 66 miles north of Mega.

In *A. Rivae* the stem is usually short, or procumbent and up to 60 cm. long. When planted closely in hedges demarcating fields, stems may reach

1 met. in height. The leaves are tough and leathery, even the pulp being difficult to cut. At Mega, numbers of plants were observed on graves.

A. Rivae has an affinity with *A. secundiflora* Engler, but the flowers are not minutely white flecked.

The description is based on numbers of plants flowering on 7 September, 1953, near Mega, c. 4°05′N., 38°20′E., alt. 6,200 ft.

Plant succulent, solitary or in small groups.

Stem usually short, sometimes procumbent and up to 60 cm. long.

Leaves leathery, about 20, densely rosulate, rather compact, arcuate-erectly spreading, somewhat deltoid, up to 50 cm. long, up to 17 cm. broad at base, 2—3 cm. thick, gradually attenuate, the apex a spine; *upper surface* dull olive-green to brownish-green, flat low down, slightly canaliculate towards apex, of uniform colour throughout; *lower surface* rounded and of similar colour; *margins* reddish tinged, armed with firm semi-cartilaginous teeth which are reddish-brown and horny at apex, deltoid, more crowded near base, more distant upwards, about 4 mm. long, 10—15 mm. apart, the interspaces straight, obsolescent near apex. *Sap* dries deep purple.

Inflorescence a many-branched pyramidal panicle, about 60—70 cm. high; usually 2, simultaneous or consecutive.

Peduncle plano-convex and 2 cm. broad at base, divaricately about 12-branched, the lowest of which a panicle of 6—8 branches, producing a total of 45—50 racemes, lowest branches subtended at base by a broadly and shortly ovate-acute bract 15 mm. broad, 7 mm. long, thin, scarious 7—10-nerved.

Racemes laxly flowered, averaging 10 cm. long, 7 cm. diam., usually oblique with the flowers subsecund, the buds dull scarlet, grey-tipped and with a bloom, open flowers spreading horizontally to nutant.

Bracts very small, ovate-acute, 2—4 mm. long, 2—3 mm. broad, dirty white, thin, scarious, 1—3-nerved.

Pedicels lowest average 12 mm. long.

Perianth scarlet with a bloom, averaging 33 mm. long, cylindric-trigonous, basally flat, 10 mm. diam. across the ovary, thence trigonously indented and narrowing slightly to the throat with the mouth wide open; *outer segments* free for 13 mm. with broad border, 3-nerved, the apices subacute and much spreading; *inner segments* themselves free but dorsally adnate to the outer to near the middle, the upper third broader than the outer, pale, with prominent median nerve, the apices more obtuse and more spreading than the outer, and markedly brown-edged.

Filaments filiform-flattened, the 3 inner narrower and lengthening before he 3 outer with their *anthers* in turn exserted 4 mm.

Style yellow with *stigma* at length exserted 5 mm.
Ovary pale olive-green, 8 mm. long, 3 mm. diam.

Acknowledgment.

This is one of the species investigated as a result of a travelling grant from the South African Council for Scientific and Industrial Research which enabled me to visit Ethiopia and Somalia for that purpose.

Fig. 1.

Fig. 2.

Plate VI.

Aloe Rivae Bak.

Fig. 1. Plant fl. 8 September, 1953, at Mega, Borana, S. Ethiopia. Height 90 cm.

Fig. 2. Flowers 1/1, from bud to fruit stage.

BOOK REVIEW.

Veld Types of South Africa. By J. P. H. Acocks. Bot. Surv. of S. Africa, Mem. 28, 1953. Pretoria. pp. v and 192. 5 inset maps and 2 coloured wall maps. 20/-.

The publication of this vegetation map and memoir mark a very definite advance in the study of S. African vegetation. There have been published in the past a considerable number of maps of the vegetation of the Union which have varied greatly in scale and in their degree of accuracy and of detail. The present map stands out from all both on account of its larger scale and hence greater amount of detail demonstrable, and especially on account of the much greater degree of accuracy and knowledge upon which it is based. An inset map shows the journeys made by the author and his points of detailed observation. This map indicates very clearly the completeness of cover that has been attained. Inevitably some parts are more fully covered than others, but it is evident from this map that no part has been omitted and hence that the boundaries shown can be relied upon.

The actual description of the vegetation is based on direct observation of the composition and structure and if the types described are essentially local units they have at least the advantage of not being forced into any preconceived scheme. The veld type as used here is defined as "a unit of vegetation whose range of variation is small enough to permit the whole of it to have the same farming potentialities". Throughout this emphasis on the practical value is kept to the fore. Succession and similar concepts are dealt with but are made subservient to the practical aspect.

In all considerations of vegetation the dynamic angle is prominent. No vegetation is static but is always changing from one cause or another. There is always variation in composition and structure in accordance with detailed local conditions of the habitat. A chart of a small area from one type is reproduced to illustrate this local variability.

In S. Africa profound changes have taken place and are taking place in the vegetation as the result of man's activities especially his mismanagement of the veld. The most far-reaching factor in this is grazing. In any vegetation made up of a number of plants some are eaten in preference to others. As soon as the rate of consumption equals or exceeds the rate of plant growth, change is inevitable. Destructive change of this kind in very general terms results in a reversal of the developmental succession. If it is continued a stage is reached, which is termed the "critical phase", beyond which the plants cannot exercise control and

either erosion or invasion by plants from less favoured habitats or both occur. A generalised inset map shows that almost the whole of the vegetation of the western half of the country has already reached or passed this critical phase. In other words it is open to erosion and replacement by desert or semidesert vegetation.

The vegetation of the Union has been exposed to destructive changes since the advent of a settled population. The author provides three most interesting and instructive coloured inset maps which show first the probable primitive state of the vegetation at about 1,400 A.D., second the existing state, and third what may be expected in a 100 years' time if present trends are allowed to continue.

A comparison of these three maps gives a striking and frightening picture of the spread of arid and even desert conditions from west to east. The picture for the future is indeed depressing but according to the author by no means exaggerated. It is based on the assumption that present practices continue and importantly that the Kalahari region is not opened up to exploitation. Even so it is obvious that unless serious steps are taken the future is bleak in the extreme. Fortunately, it is not inevitable. The author who may be a realist but is far from a pessimist, has provided a further map which shows what might be the result of real scientific management of our veld. This map indicates a remarkable parallelism with that for the primitive state of the vegetation except for the inevitable disappearance of forest. It undoubtedly opens a door for hope for the future but it is a future that can only be attained by real effort and work. The danger from the advancing deserts is real and pressing. It is earnestly to be hoped that this striking series of maps may help to arouse the country to a realisation of the dangers facing it and result in immediate action to combat them.

It is a little disappointing that this most stimulating part of the work is at present dealt with in outline only. Little more than the conclusions are given. The evidence upon which these conclusions are based is promised in a future more detailed memoir. It is very much to be hoped that this fuller account will not be unduly delayed in appearance.

The main part of the memoir is occupied by outline descriptions of the veld types. Seventy of these are recognised and of these a number are subdivided. The types are based primarily on floristic features. Each type has been analysed and estimates made of what is termed 'relative abundance'. This is expressed as a figure which indicates the number of individuals per morgen. It seems to the writer that such figures are not of much value unless modified by relation to the structure of the vegetation itself. In many cases there are references under the veld type to previous descriptions or to published photographs.

It is not possible to deal here with these descriptions of veld types. It is inevitable that the treatment is somewhat unequal, those of agricultural value are obviously more fully treated. Few will agree wholly with either the grouping of the types or with the names applied to them. In the text no reference is made to the position or extent of the different types. For this reference has to be made to the map.

Finally a word on the maps. There are two, covering the western and eastern halves of the country. They are on the scale 1: 1,500,000. They are printed on stiff paper. Each is 28 x 40 inches. On the maps the veld types are shown in clear colours which stand in good contrast to one another so that the boundary lines are readily seen. The printing of the maps is excellent, they are both clear in their purpose and very pleasing in themselves.

There is a short bibliography and a full index to plant names in which valuable species, harmful and poisonous species are specially indicated.

The memoir and maps are priced reasonably at £1, and are obtainable from the Government Printer, Pretoria. Maps and memoir are not sold separately.

It is hoped that this publication will have a wide sale and that its study will be undertaken seriously and that the lessons it inculcates will result in action as soon as possible.

R. S. Adamson.

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A REVISION OF METALASIA

By N. S. Pillans.

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The genus *Metalasia* was founded by Robert Brown in 1817. It comprised three species, two being removed subsequently. The generic characters, published by Brown, are retained for the genus as understood now, but certain variations of and additions to those characters have appeared in later species. The number of species was not much increased until D. Don added eight in 1826. Lessing published six in 1832 and Harvey five in 1864. Harvey's revision in the Flora Capensis was the last comprehensive account of the genus. In 1837 De Candolle removed *M. imbricata* and *umbellata* with which he founded the genus *Erythropogon*, distinguishing it by pedicellate capitula and sessile achenes, characters without generic value in this instance. Neither De Candolle nor Harvey appear to have seen the palleae accompanying the outer florets of *M. umbellata*, a character which excludes it from both genera and necessitates its removal to the genus *Lachnospermum* Willd.

Metalasia is endemic in South Africa, is confined within the limits of the so-called Cape flora and occurs chiefly in the south-western area occupied by that flora, accompanying it to some of the mountainous parts of Natal, Orange Free State and Transvaal where it is represented by *M. muricata*. The altitudinal range of distribution is from the coast to the upper slopes of the higher mountains. Most species are confined to low mountains and sandy soils of coastal hills and flats in the south-western districts where *M. muricata* often forms dense thickets.

In most species the leaves are of two distinct sizes, the larger developing first, the smaller, arising in tufts or on very short branchlets in the axils of the larger leaves, are absent from some species. Only the larger leaves are described here in detail. The twisting of the leaves is clockwise as viewed from the apex. It varies in some species from half

a twist to two twists. The capitula are usually very closely arranged in compact corymbs and more or less bound together with long hairs which arise on the back or margins of the scales. These involucral scales are usually of two kinds, the outer being the shorter and narrower and often partly of a modified leaf-type, the inner are mostly longer, wider and with a more or less petaloid and conspicuously coloured apical portion. The pappus bristles vary little except in a few species where the upper half is unusually wide, clavate in outline and penninerved. The corolla, also, shows little variation, usually tubular and with small variously deltoid lobes. Achenes of only a few species have been seen, but their appearances suggest that they may provide useful characters for future classification. The examination of a considerable amount of material with very great variation in the characters has indicated the advisability of enlarging the scope of most species. A species may be represented by two or more constantly distinct forms in one area, in other areas by only one of these forms, and in yet other areas by forms with characters which unite the most distinct forms of the first area. Such variations may be likened to long and short links of a chain, the former representing the more distinct and commoner forms, the latter representing the marginal and less defined forms. [Harvey found "the species difficult to characterise."] As no adequate study has been made of conditions in the field, very little is known about the selective influences which may be considered responsible for the origination of such variations, but in some areas it seems evident, by external characters, that adaptative adjustment in variable response to environmental changes has been the chief factor and that the adaptations have selective value, different parts being affected in different degree.

Some relevant literature and some of the older collectings have not been available for use during the preparation of this revision, but probably all distinct published species with rank of priority have been included. All previous descriptions of the genus and species have been revised. Varieties have been either included in the descriptions of the species or reduced to forms. The records of distribution of the species are placed under political divisions arranged in alphabetical order. A mark of exclamation (!) denotes that the type or syntype has been seen.

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METALASIA *R. Br. in Trans. Linn. Soc.* xii, 124 (1817); *D. Don, Act. Soc. Wern.* v, 556 (1826); *Less. in Linnaea* vi, 223 (1931); ej. Syn. 334 (1832); *Endl. Gen.* No. 2753 (1838); *Harv. Gen. S. Afr. Pl.* 186 (1838); *Harv. in Harv. & Sond. Fl. Cap.* iii, 265 (1864); *Harv. Gen. S. Afr. Pl.* ed. 2, p. 190 (1868); *Benth. & Hook. f. Gen. Pl.* ii, 325 (1876); *Baill. Nat. Hist. Pl. trans. Hartog* viii, 182 (1888); *Engl. & Prantl, Pflanzenfam.* iv, § 5, p. 197 (1894); *Thonner, die Blutenpfl. Afr.* 596 (1908); ed. 2, p. 563 (1915); *Phillips, Gen. S. Afr. Fl. Pl.* 644 (1926); *Levyns, Guide Fl. Cape Penin.* 258 (1929); *in Fl. Cape Penin.* 793 (1950); *Phillips, Gen. S. Afr. Fl. Pl.* ed. 2, p. 799 (1951). **Endoleuca** *Cass. in Bull. Soc. Philom.* 47 (1819); *in Dict. Sc. Nat.* xiv, 474 (1819). **Tuloclinia** *Rafin, Fl. Tellur.* iv, 119 (1836). **Erythropogon** *D.C. Prodr.* vi, 254 (1837) partly.

Variously branched shrubs or shrublets. Branches ascending or rarely decumbent, more or less striate or sulcate, mostly tomentose. Leaves usually closely set, alternate, sessile or shortly petiolate, exstipulate, occasionally decurrent, linear, oblong, lanceolate or oblanceolate, more or less concave and hairy above, with involute margins, convex and glabrous or slightly hairy beneath, more or less twisted or untwisted, mostly with a tuft of small leaves or a rudimentary branchlet in the axil. Capitula mostly cylindrical or narrowly campanulate, in branched or unbranched corymbose clusters at the ends of the branches, few- or many-flowered, homogamous. Involucral scales in few or many series, mostly closely imbricate; the outer usually acute; the inner usually with a widened more or less petaloid upper portion. Pappus bristles mostly serrulate, widened and often somewhat clavate and distinctly nerved in the upper half. Corolla tubular, slightly widened towards the mouth, with variously deltoid lobes, glabrous. Anthers sagittate. Ovary oblong, angular, occasionally with a membranous disk at the apex. Style with truncate branches. Achenes oblong or elliptic, with dorsal, ventral and lateral angles, rarely with narrow wings on the upper half of the lateral angles.

KEY TO THE SPECIES.

* Leaves mostly untwisted at maturity, rarely some twisted:
  Capitula about 50-flowered .. .. (1) *imbricata*
  Capitula less than 15-flowered:
    Capitula usually 8—13-flowered .. .. (3) *pallida*
    Capitula less than 8-flowered:
      †Capitula 5—8-flowered:
        Leaves mostly with gemmuliferous axils:
          Petaloid involucral scales concave—incurved at the apex .. (9) *agathosmoides*
          Petaloid involucral scales not incurved—concave at the apex:
            Branches and involucres clothed with long woolly hairs .. (7) *strictifolia*
            Branches and involucres clothed with very short tomentum (25) *tricolor*

Leaves mostly without gemmuliferous axils:
Petaloid involucral scales very obtuse .. .. (17) *aduncа*
Petaloid involucral scales acute:
Lowermost involucral scales reaching up to the base of the petaloid part of the inner scales .. .. .. (5) *Galpinii*
Lowermost involucral scales not reaching up to the base of the petaloid part of the inner scales .. .. .. (8) *pulcherrima*

††Capitula 2—5-flowered:
Leaves very erect and imbricate .. .. (11) *erectifolia*
Leaves not as above:
Leaves rugose and shiny on the back:
Leaves oblanceolate .. .. (31) *cymbifolia*
Leaves lanceolate or linear .. .. (24) *gnaphalodes*
Leaves not as above:
Leaves not distinctly incurved .. .. (21) *muricata*, form B
Leaves distinctly incurved:
Leaves distinctly widened at the base, without an evident dorsal nerve; involucres with conspicuous modified leaves at the base .. .. .. (30) *incurva*
Leaves not distinctly widened at the base, with an evident dorsal nerve; involucres with inconspicuous modified leaves at the base .. .. .. (21) *muricata*, form K

**Leaves mostly twisted at maturity:
Capitula mostly 10- or 11-flowered .. .. (2) *Lichtensteinii*
Capitula less than 9-flowered:
Capitula mostly 5—8-flowered:
Petaloid involucral scales shortly exserted, lemon-yellow .. (26) *octoflora*
Petaloid involucral scales much exserted, white:
Involucral scales mostly with a petaloid portion .. .. (32) *Cephalotes*, form C
Involucral scales mostly without a petaloid portion .. .. (21) *muricata*, form E
Capitula 3—5-flowered:
‡Capitula 5-flowered:
Involucre without distinct loosely arranged woolly hairs:
Petaloid involucral scales with the exserted portion distinctly longer than wide .. .. (21) *muricata*, form G
Petaloid involucral scales with the exserted portion as wide or wider than long:
Petaloid involucral scales acute, white .. .. .. (10) *langebergensis*
Petaloid involucral scales very obtuse or subtruncate, yellowish:
Corymbs distinctly branched, usually with more than 15 capitula .. .. (22) *aurea*
Corymbs not distinctly branched (capitula pedunculate), with fewer capitula .. .. (26) *octoflora*
Involucre with distinct woolly hairs, at least at the base:
Capitula not bound together with a mass of tangled woolly hairs up to the base of the petaloid part of the inner involucral scales:
Petaloid involucral scales erect:
Corymbs not distinctly branched .. .. (23) *juniperoides*
Corymbs distinctly branched:
Petaloid involucral scales lanceolate, white .. .. (21) *muricata*, form C
Petaloid involucral scales oblanceolate, pink .. .. (27) *seriphiifolia*
Petaloid involucral scales erect-spreading or spreading in the upper half:
Leaves with scattered silky hairs beneath, corymbs evidently branched .. .. (19) *quinqueflora*
Leaves glabrous or tomentose beneath, corymbs not evidently branched:
Leaves slightly twisted or some not twisted, with deciduous tomentum beneath .. .. .. (6) *Alfredii*
Leaves distinctly half-twisted, either persistently tomentose or glabrous beneath .. .. .. (18) *Bodkinii*
Capitula bound together by a mass of tangled woolly hairs up to the base of the petaloid part of the inner involucral scales:
Branches clothed with pink tomentum .. .. .. (13) *rhoderoides*
Corymbs subtended by many conspicuous adpressed leaves arranged in the form of an involucre .. (16) *Bolusii*
Corymbs subtended by a few leaves not arranged as above:
Corymbs 2·5—3·5 cm. wide; outer petaloid involucral scales very obtuse .. .. (33) *Barnardii*
Corymbs much less than or rarely approaching 2·5 cm. in diameter; outer petaloid involucral scales not or rarely very obtuse .. .. (32) *Cephalotes*

‡‡Capitula 3- or 4-flowered:
§Involucres bound together by a mass of loosely tangled woolly hairs up to the base of the petaloid part of the inner involucral scales:
Leaves with an evident nerve or keel throughout the length of the lower surface:
Corymbs much branched .. .. (14) *riparia*

Corymbs not branched or branched once or twice:
Leaves with shaggy hairs beneath; pappus bristles distinctly widened from the base, lanceolate and slightly concave towards the apex .. .. (15) *confusa*
Leaves cobwebby—woolly beneath; pappus bristles not distinctly widened from the base nor lanceolate and concave towards the apex .. .. (13) *rhoderoides*
Leaves without an evident nerve or keel on the lower surface:
Leaves distinctly widest above the middle, usually cymbiform .. .. (31) *cymbifolia*
Leaves not as above:
Petaloid involucral scales obtuse and acute in the same capitulum .. .. (16) *Bolusii*
Petaloid involucral scales all obtuse:
Corymbs usually 1·2—1·5 cm. wide, up to 2·3 cm., usually quite distinctly branched; petaloid involucral scales with a rotund or orbicular limb; pappus bristles filiform below the middle, ± obtuse (4) *brevifolia*
Corymbs very compact, usually 0·7—1 cm. wide, not distinctly branched; petaloid involucral scales with an elliptic limb; pappus bristles narrowly linear below the middle, ± acute .. .. (28) *intermedia*

§§Involucres not bound together by a mass of loosely tangled woolly hairs up to the base of the petaloid part of the inner involucral scales:
Involucres subtended by conspicuous modified leaves reaching to or above the middle of the involucre:
Leaves 2—3 mm. long, appearing to be soft and viscid .. (29) *Phillipsii*
Leaves mostly 6 or more mm. long, not as above:
Stems diffusely branched; corymbs mostly 0·7—1 cm. wide; involucres mostly 4—5 mm. long .. .. (20) *tenuifolia*
Stems erect or almost so; corymbs mostly 1·5—2 cm. wide; involucres mostly 5—6 mm. long .. .. .. (27) *seriphiifolia*
Involucres subtended by inconspicuous modified leaves not reaching up to the middle of the involucre:
Petaloid involucral scales acuminate .. .. .. (12) *Schlechteri*
Petaloid involucral scales acute or obtuse:
Petaloid involucral scales with the exserted portion about as wide as long, very obtuse, with membranous margins ... . (22) *aurea*
Petaloid involucral scales not as above .. .. .. (21) *muricata*

1. **M. imbricata** *Harv. in Harv. & Sond. Fl. Cap.* iii, 266 (1864) excl. syn. *Burm.* **Staehelina imbricata** *Berg, Pl. Cap.* 233 (1767); *Thunb. Prodr.* 143 (1794); *Pers. Syn. Pl.* ii, 391 (1807); *Thunb. Fl. Cap. ed. Schultes* 628 (1823). **Xeranthemum vermiculatum** *Lam. Dict.* iii, 240 (1790); ej. *Illus.* t. 693, f. 3 (1823). **Helichrysum vermiculatum** *Pers. Syn. Pl.* ii, 415 (1807); *Spreng. Syst. Veg.* iii, 484 (1826). **Argyrocome vermiculata** *Poir. in Lam. Encycl.* iii, 270 (1823). **Metalasia uniflora** *Don Act. Soc. Wern.* v, 27 (1826); *Less. Syn.* 334 (1832). **Tuloclinia imbricata** *Rafin. Fl. Tellur.* iv, 119 (1836). **Erythropogon imbricatum** *DC. Prodr.* vi, 255 (1837) excl. syn. *Burm.* **Argyrocome imbricata** *Buek, Ind. DC. Prodr.* ii, 15 (1840). **Metalasia virgata** *Compton in Journ. S. Afr. Bot.* xv, 106 (1949) !

A much branched erect and wiry shrublet usually 35—50 cm. high, with tomentose branchlets. Leaves 4—5 mm. long, lanceolate, ovate-lanceolate or ovate, acute, mucronate, untwisted, sessile, rounded and glabrous beneath, tomentose above, slightly involute at the margins, closely set, erect-spreading, without small leaves in the axil. Inflorescence consisting of 1—5 capitula on simple or rarely divided short branchlets. Capitula about 1 cm. long, narrowly campanulate, about 50-flowered, with 1—3 small leaves at the base. Non-petaloid involucral scales in about 4 series, lanceolate or ovate-lanceolate, acute, apiculate, clothed

with long woolly hairs on the dorsal surface, closely imbricate except above the middle. Petaloid scales in 2 series, oblong-lanceolate or oblong, acute, tomentose on the back except on the membranous, whitish and erect-spreading upper portion. Pappus bristles usually 46—59, arranged in one series, filiform, serrulate and slightly widened towards the acute apex, wine-red. Corolla about 5 mm. long, narrowly clavate, with lanceolate, acute lobes 1 mm. long. Anthers white, with bristle-like, straight tails. Ovary surmounted by a cupola-shaped, toothed disk and with 2 ventral and 3 dorsal, longitudinal ridges of which the lateral on the back are ± serrulate.

Without precise locality, *Pole-Evans* 4316, *Zeyher* in National Herb. 11998.—Bredasdorp Div.: Elim, *Compton* 22632, *Schlechter* 7691, 10475; near Bredasdorp, *Levyns* 4867a; The Poort, *L. Bolus* in Bolus Herb. 20540; Strandkloof, limestone hills, *Compton* 20459 (type of *M. virgata* in Kirstenbosch Herb.), 21937, *Lewis* in S. Afr. Mus. Herb. 60380.—Cape Div.: Cape Flats, Bolus 3286; between Sandvlei and Tigerberg, *Burchell* 967; near Pinelands, "Raapenberg", *Guthrie* 373, 810.—Malmesbury Div.: Mamre, *Levyns* 3911; Dassenberg, *Drège* sine num.; between Malmesbury and Mamre Road Station, *Salter* 4364; between Paardeberg and Groene Kloof, *Drège* in National Herb. 11999, 12835, in S. Afr. Mus. Herb. 49700.—Paarl Div.: Kraaifontein, *Dümmer* 1206.—Stellenbosch Div.: Kuils River, *Levyns* 4252; 2 miles east of Faure, *Salter* 4327, *Galpin* 12564; west base of Hottentots Holland Mts., *Ecklon* 486; Jackhals Vlei, *Zeyher* 900.

Although this species has a very distinct appearance there does not appear to be any character by which it should be excluded from the genus as at present understood. Harvey's remarkable statement that the capitula contain 200 florets may be due to his having made a rough guess.

2. **M. Lichtensteinii** *Less. Syn.* 335 (1833); *DC. Prodr.* vi, 253 (1837); *Harv. in Harv. & Sond. Fl. Cap.* iii, 268 (1864). **M. umbellata** *Cass. Dict. Sc.* xxx, 223 (1834)?

A robust shrub commonly 1—1·5 m. high, with rigid, ascending branches tomentose on the upper parts. Leaves mostly 0·6—1 cm. long, usually crowded, linear, pungent-mucronate, involute, twisted once or twice, at first with silky hairs beneath, erect-spreading or spreading almost always with a conspicuous tuft of small leaves in the axil. Corymbs usually 2—3 cm. wide, hemispherical, dense, branched. Capitula 0·8—1 cm. long, cylindric, slightly widened above the middle, subtended by an untwisted modified leaf, unattached, usually with 10 or 11 flowers. Outer involucral scales in 2 series, oblong-lanceolate, acute, bound

together with long woolly hairs, reaching to the middle of the involucre. Petaloid scales in 5 series, oblong-lanceolate, acute, concave, white, with the upper half erect-spreading, translucent; the outer bound together with long cilia. Pappus bristles serrulate in the lower half, distinctly lanceolate, obtuse, nervose and toothed towards the apex. Corolla 4 mm. long, cylindric, slightly widened from the base upwards, with narrowly deltoid lobes.

Without precise locality, *Bowie* in S. Afr. Nat. Herb. 12834.—Caledon Div.: Hottentots Holland Mts., *Zeyher* 2910, *Guthrie* 2043, *Stokoe* 6577, *Burchell* 8218; Steenbras, *Moss and Rogers* 1503, *Rogers* 17815, *Salter* 5126; near Elgin, *Compton* 12274, *Hubbard* 475, *Levyns* 3300; *Stokoe* 8156; Kogelberg, *Stokoe* 8157, *Barker* 3317; Platteberg and Paardeberg, *Stokoe* 9072, in S. Afr. Mus. Herb. 56603; Paardeberg, *Adamson* 4905; west end of Buffels Mt., *Pillans* 8269; Palmiet River, *Levyns* 7759, *Schlechter* 5429, *Stokoe* 8724, in S. Afr. Mus. Herb. 56984; Hanglip, *Compton* 13607; Palmiet River Mts., *Barnard* in S. Afr. Mus. Herb. 40467, *Compton* 14122; Palmiet River Mouth, hills, *Levyns* 5381; Bot River, *Levyns* 944; without precise locality, *Stokoe* in Bolus Herb. 25225.

3. **M. pallida** *Bolus in Trans. S. Afr. Phil. Soc.* xvi, 384 (1906)! *De Wildeman, Pl. Nov. Herb. Hort. Then.* ii, t. 68 (1908).

A rigid much branched shrub 25—35 cm. high, with densely lanate ascending branchlets. Leaves mostly 5—8 mm. long, lanceolate-linear or acicular, acute, pungent-mucronate, rather closely involute, angular, rugulose and glabrous on the back, broad-based, ascending, crowded, untwisted, mostly without small leaves in the axil. Corymbs mostly 1·3—1·5 cm. wide, densely and very shortly branched. Capitula 7—8 mm. long, narrowly cyathiform, usually with 8—13 flowers, occasionally with 7 flowers, covered with appressed woolly hairs on the lower half, often subtended by a modified leaf. Outer scales in 3 or 4 series, shortly exserted from the hairy covering; the outermost linear, acute, reaching to near the middle of the capitulum; the remainder slightly longer, linear-oblong, acute. Petaloid scales in 3 or 4 series, oblanceolate, very obtuse, distinctly concave at the apex, white. Pappus bristles very slender and serrulate below the middle, lanceolate-linear and distinctly toothed towards the apex. Corolla 4 mm. long, cylindric in the lower half, widening slightly upwards.

Oudtshoorn Div.: Roodeberg, *Acocks* 14623, *Barker* 5497, *Morris* 229; Zwartberg, *Stokoe* in S. Afr. Mus. Herb. 5688, 5689.—Prince Albert Div.: Zwartberg Pass, summit, *Bolus* 11542 (type, in Bolus Herb.), *Acocks* 15532; near Klaarstroom, "Middelwater", *Levyns* 6612.—Union-

DALE DIV.: Uniondale, *Paterson*; Zuurberg, Georgida, *Fourcade* 4634; Slypsteenberg, south slopes, *Esterhuysen* 6280.

4. **M. brevifolia** *Levyns in Journ. S. Afr. Bot.* viii, 283 (1942); *in Flora Cape Penin.* 794 (1950). **Gnaphalium muricatum** var *γ Linn. Sp. Pl.* 853 (1753). **G. muricatum** var. **fasciculatum** *Berg, Pl. Cap.* 267 (1767). **G. brevifolium** *Lam. Encycl. Meth.* ii, 744 (1786). **G. frutescens etc.** *Burm. Rar. Pl. Afr.* 223, t. 79, f. 3 (1788). **G. fasciculatum** *Thunb. Fl. Cap. ed. Schultes* 645 (1823) non *Lam.: Pers. Syn. Pl.* ii, 417 (1807). **Metalasia fasciculata** *D. Don in Mem. Wern. Soc.* v, 557 (1826); *Less. Syn.* 339 (1832); *DC. Prodr.* vi, 253 (1837); *Harv. in Harv. & Sond. Fl. Cap.* iii, 271 (1864). **M. Eckloniana** *DC. Prodr.* vi, 252. **M. erubescens** *DC.* var. **gemmulifera** *Harv. op cit.* 269!

An erect much branched shrublet usually 20—30 cm. high, with closely lanate branchlets. Leaves usually 2—5 mm. (up to 6 mm.) long, linear, acute, mucronate, closely involute, completely twisted, at first sparsely lanate beneath, becoming glabrous except on the upper surface, spreading or ± declinate, crowded, with many small leaves in the axil. Corymbs usually 1·2—1·5 cm. (up to 2·3 cm.) wide, usually quite distinctly branched. Capitula 4·5—6 mm. long, cylindric, attached by woolly hairs up to the middle, 3-flowered, each subtended by a linear expanded and appressed leaf reaching to the middle, usually in groups of three. Involucral scales in 5 or 6 series, with an erect white limb; the outer two-thirds as long as the inner, with rotund or ovate, subacute or obtuse limb; the inner with an ovate or elliptic, very obtuse, usually emarginate or toothed limb. Pappus bristles slender and serrulate in the lower half, distinctly widened and penninerved above, usually obtuse. Corolla 3—3·5 mm. long, gradually widening from the base, with narrowly deltoid lobes.

WITHOUT PRECISE LOCALITY, *Thom* 949, *Zeyher* 899, 4859.—BREDASDORP DIV.: hills near Elim, *Bolus* 8553; "Nachtwacht", *Smith* 2956, 4279; Mierkraal, *Smith* 4935; Bredasdorp, *Galpin* 10490; Koude Rivier, *Schlechter* 9582; Baardscheerdersbosch, *Stokoe* in S. Afr. Mus. Herb. 61925, 61927.—CALEDON DIV.: between Babylons Tower and Caledon, *Ecklon* (syntype of *M. erubescens* DC. var. *gemmulifera Harv.* in S. Afr. Mus. Herb.); between Donkerhoek and Houwhoek, *Burchell* 8015; near Bot. River, *Bolus* 4144, *Compton* 21984; Donkerhoek Mt., *Burchell* 7980. Palmiet River Mts., *Stokoe* in S. Afr. Mus. Herb. 61924, 61929; near Storms Vlei, Dasberg, *Stokoe* in S. Afr. Mus. Herb. 61926; 8 miles inland from Gansbaai and Danger Point, *Stokoe* in S. Afr. Mus. Herb. 57008; Hawston, *Esterhuysen* 19602; Rooiels, *Stokoe* 6572; north side of Viljoen's Pass, *Gillett* 756.—CALVINIA DIV.: 3 miles west of Nieuwoudtville. *Stokoe*

in S. Afr. Mus. Herb. 61922; Botterkloof Pass, *Barker* 6510.—Cape Div.: Table Mt., *Forbes* 118; Muizenberg, *Bolus* 7293, *Barker* 4203; Kalk Bay Mts., *Compton* 18593; Fish Hoek Mt., *Compton* 3254; north-west of Fish Hoek, *Pillans* 3289; Simon's Bay, *MacGillivray* 625; Simon's Town Mts., *Compton* 14013; Klassjagersberg, *Barker* 4309; Buffels Bay, *Hutchinson* 656; Witsand, *J. C. Smuts* (sine num.) 30 Oct. 1927; "Driefontein", *Zeyher* 898; Mamre Road, *Esterhuysen* 18872, *Levyns* 3264; Mamre, *Bolus* 25253; between Eerste River and Zwartklip, *Pillans* 9220.—Clanwilliam Div.: Pakhuis Pass, *Compton* 6956, *Galpin* 11099, *Levyns* 3942, *Maguire* 1059, *Salter* 2763; Naadouw Kloof, *Stokoe* in S. Afr. Mus. Herb. 61968, *Levyns* 9444; "Modderfontein", *Stephens* in Percy Staden Mem. Exped. 6975.—Malmesbury Div.: near Hopefield, *Bolus* 12716, *Letty* 44 near Darling, *Stokoe* in S. Afr. Mus. Herb. 61928.—Mossel Bay Div.: Mossel Bay, *Burchell* 6233, *Maguire* 465, *Moran* in Bolus Herb. 25252, *Rogers* 4136.—Paarl Div.: French Hoek Mts., *Schlechter* 9337; near Kraaifontein, *A. M. Wilman* 960; Klapmuts, *Levyns* 8631; Joostenberg, *Esterhuysen* 16018; Bailey's Peak, *Esterhuysen* 22332.—Port Elizabeth Div.: Port Elizabeth, *Kemsley* 245; Walmer, *West* 210; Theescombe, *Holland* in Bolus Herb. 25251.—Riversdale Div.: Albertinia, "Oude Tuin", *Muir* in Rogers Herb. 16699.—Stellenbosch Div.: Kuils River, *Ecklon* 479.—Van Rhynsdorp Div.: Giftberg, *Esterhuysen* 21988.—Worcester Div.: Orchard Siding, *Rogers* 16567; Hex River Pass, *Compton* 22842.

Form b. Involucral scales with a smaller, distinctly rounded and concave free upper portion or limb. Pappus bristles slightly widened, smooth.

Worcester Div.: near De Doorns, *Bolus* 13132, in S. Afr. Mus. Herb. 38541; near Orchard, *Esterhuysen* 10937; entrance to Buffelshoek Kloof, *Esterhuysen* 14942.

The conspicuously smaller, more deeply concave and constantly rounded free portion of the involucral scales in this form may suggest undeserved specific distinction.

5. **M. Galpinii** *L. Bolus in Ann. Bolus Herb.* iv, 109 (1927)!

A rigid much branched shrub 1—1·5 m. high, with ascending wiry branches lanate on the younger parts. Leaves mostly 1—1·2 cm. long, acicular, acute, pungent-mucronate, closely involute, rugose and glabrous beneath, untwisted, erect-spreading, slightly spreading at the apex, mostly without leaflets in the axil. Corymbs 1·5—2 cm. wide, shortly and obscurely branched, compact. Capitula 6—7 mm. long, cylindric, widening above the middle, 5- or 6-flowered, each subtended by a slender scale-like leaf reaching to the middle. Outer scales in 4 series, cartilagin-

ous, acute, erect, for the most part bound together by woolly hairs; the outermost acicular, the remainder reaching to shortly above the middle of the capitulum. Petaloid scales in 3 series, oblanceolate, acute, minutely toothed, glabrous, white, with the free portion erect-spreading, keeled behind the apex. Pappus bristles serrulate, distinctly widened and toothed above the middle. Corolla 3·5 mm. long, slightly widened in the upper half. Achenes oblong, with 1 dorsal and 2 lateral ridges, with very narrow, pale wings on the upper half of the marginal area.

Ladismith Div.: north entrance to Garcia's Pass, *Galpin* 4146 (type, in Bolus Herb., syntype in S. Afr. Mus. Herb.), *Bolus* 11319, *Levyns* 2296, *Thorne* in S. Afr. Mus. Herb. 38865.—Riversdale Div.: Langeberg, above "Phisantefontein", *Muir* 3135.

Form B. Leaves linear or lanceolate-linear. Corymbs conspicuously branched. Involucral scales all erect.

Ladismith Div.: Roodeberg, south slopes, *Esterhuysen* 17184.—Mossel Bay Div.: near Goliath's Berg, *Muir* 2209.—Swellendam Div.: south slopes of Augsberg, *Esterhuysen* 17060, *Stokoe* 8158.

The leaf-characters closely resemble those of *M. pallida Bolus*, but the two species are readily distinguished by very differently shaped petaloid involucral scales.

6. **M. Alfredii** sp. nov.; fruticulus sat rigidus, ramis dense foliosis lato-tomentosis; folio plus minusve torta oblanceolata vel subspathulata pungenti-mucronata dense lanata, deinde glabrescentia, axilis saepe gemmiferis; capitula 4-5 fl. cyathiformia; involucri squamae 3-seriatae oblongae, interiores lineari-oblongae, apice obtusissimae, e medio patentes albae; pappi setae serrulatae, superne leviter ampliatae.

A rigid, much branched, erect shrublet 15—25 cm. high, with lanate, closely leafy branchlets. Leaves 5—7 mm. long, oblanceolate or subspathulate, acute, pungent-mucronate, ±involute, at first densely lanate on both sides, becoming partly glabrous beneath, slightly or not twisted, erect-spreading, with or without small leaves in the axil. Corymbs usually 1—1·3 cm. wide, widely obconic, compact, unbranched, closely subtended by leaves. Capitula 6—8 mm. long, stipitate, narrowly cyathiform, mostly 4—5-flowered, occasionally 6-flowered. Outer involucral scales in 3 series, oblong, acute, mucronate, cartilaginous, pale brown. Inner scales in 2 series, linear-oblong, rounded at the apex, ± apiculate, membranous at the margins, with an erect-spreading, white free portion. Pappus bristles acute, penninerved and distinctly toothed in the slightly widened upper half. Corolla 4 mm. long, linear, slightly widened at the base, with narrowly deltoid lobes.

Caledon Div.: Rivier Zonder Einde Mts., *Barnard* in S. Afr. Mus. Herb. 27380. *Alfred Bolus* in Bolus Herb. 6879 (type), in Guthrie Herb. 4571, *Stokoe* 7573; top of Great Baviaans Kloof, *Stokoe* in Bolus Herb. 25292.

The affinity is with *M. Bodkinii* L. Bolus but differs with slightly or not twisted, pungent-mucronate leaves clothed with deciduous tomentum.

This species is named in honour of the late Mr. Alfred Bolus, nephew of Dr. H. Bolus.

7. **M. strictifolia** *Bolus in Trans. S. Afr. Phil. Soc.* xvi, 384 (1906)! *De Wildeman, Pl. Nov. Herb. Hort. Then.* ii, t. 68 (1908).

A rigid densely branched shrublet 15—30 cm. high, with erect densely tomentose branchlets. Leaves mostly 5—7 mm. long, linear-lanceolate, mucronate, widely based, involute, keeled and, at first, with long hairs on the back, ascending or erect-spreading, untwisted or occasionally some ± twisted, without small leaves in the axil. Corymbs mostly 1—1·5 cm. wide, compact, shortly tapered below, subtended by leaves. Capitula 7—8 mm. long, oblong, cuneate at the base, slightly compressed laterally, pedunculate, subtended by 2 linear, acute, foliaceous scales, free, 5-flowered. Outer scales in 4 series, linear- or oblanceolate-oblong, acute, lengthening inwards to above the middle of the capitulum, bound together with long cilia on the lower half, erect-spreading at the apex, red-brown. Petaloid scales usually 5, erect-spreading, linear-oblong, obtuse, dorsally rounded and nerved, white. Pappus bristles slender, serrulate, clavate at the apex. Corolla 3—3·5 mm. long, narrowly cylindric in the lower half, distinctly widened above, with narrowly deltoid lobes.

Without precise locality, *Hafstrom and Acocks* 1683. Prince Albert Div.: Zwartberg Pass, *Bolus* 11990 (type, in Bolus Herb., syntype in Kew Herb.), 11543, *Barnard* in S. Afr. Mus. Herb. 48185, *Esterhuysen* 4556, *Stokoe* in S. Afr. Mus. Herb. 56617, 51424.—Uniondale Div.: Mannetjesberg, *Esterhuysen* 6471; Kouga Peak, *Esterhuysen* 16264.

Notable characters are the exceptionally dense habit of growth, the lateral compression of the capitula, the fewness of the petaloid involucral scales and the clavate tips of the pappus bristles.

8. **M. pulcherrima** *Less. Syn.* 340 (1832) excl. syn. *Thunb.: DC. Prodr.* vi, 253 (1837) excl. syn. *Thunb.: Harv. in Harv. & Sond. Fl. Cap.* iii, 270 (1864) excl. syn. **gnaphalodes, lanceolata.**

A much branched shrub about 1 m. high, with ascending wiry branchlets lanate on the upper parts. Leaves mostly 0·7—0·9 cm. long, rather crowded, ascending, lanceolate or ovate-lanceolate, pungent-mucronate,

with incurved margins (the greater part of the upper surface exposed), glabrous and shiny, distinctly nerved and transversely scabrid on the back, untwisted, without small leaves in the axil. Corymbs about 2 cm. wide, closely branched. Capitula 8 mm. long, cylindric, slightly widened in the upper half, free, 5-flowered. Outer scales in 4 series, linear-lanceolate, acuminate, sharply pointed, closely bound together with silky marginal hairs, white or straw-coloured, reaching the middle of the involucre. Petaloid scales in 3 series, spathulate, acute, mucronulate, keeled behind the apex, white or yellow. Pappus bristles slender, serrulate, narrowly linear towards the apex, white or yellow. Corolla 4 mm. long, cylindric, with narrowly deltoid lobes.

George Div.: Camfer, *Esterhuysen* 7107, 16794; Montagu Pass, *Schlechter* 5830.—Ladismith Div.: Touwsberg, *Levyns* 6131, 7470, 9094; Prins Poort Berg, *Levyns* 6160.—Laingsberg Div.: Witteberg, *Compton* 10799, *Walgate* 316; Anysberg, *Stokoe* in S. Afr. Mus. Herb. 56986.—Oudtshoorn Div.: Outeniqua Mts., near Moeras River, *Barker* 7719, *Esterhuysen* 19449; Kruispad, *Compton* 21754.—Swellendam Div.: Warmwatersberg, *Levyns* 6197.—Uitenhage Div.: without precise locality *Ecklon and Zeyher* 804.

The affinity of this species is with *M. gnaphalodes* Druce from which it is distinguished by the much smaller and evenly sized rugosities on the back of the leaves, and by the 5-flowered wider capitula.

9. **M. agathosmoides** sp. nov.; ramuli apicem versus dense tomentosi folia lanceolata subacuta mucronata, basin versus valde ampliata dorsaliter glabra stricta, axilis plerumque gemmiferis; capitula 5-fl. arcte conferta; involucri squamae 5 seriatae erectae oblanceolatae vel subspathulatae obtusissimae, apice valde concavae albae vel pallide roseotinctae; pappi setae superne conspicue ampliatae.

A much branched rigid shrublet 30—40 cm. high, with densely tomentose branchlets. Leaves usually 3—4 mm. long, lanceolate, subacute, mucronate, distinctly widened at the base, sessile, involute, concave and tomentose above, obtusely angled and glabrous beneath, spreading or erect-spreading, untwisted, mostly gemmiferous in the axil. Corymbs 1·5—2 cm. wide, hemispheric, dense, shortly branched. Capitula 6—7 mm. long, tubular-obconic, 5-flowered, clasped by several modified leaves at the base. Involucral scales in 5 series, oblanceolate or subspathulate, very obtuse, loosely imbricate, ascending, with a pale pink or white free portion; the outer very deeply concave at the apex, bound together with long dorsal hairs in the lower half; the inner distinctly concave. Pappus bristles much widened and serrulate towards the obtuse or subacute apex. Corolla distinctly widened above the middle, with deltoid lobes.

Ceres Div.: Zwart Ruggens, "Kat Bakkies", *Levyns* 1836.—Clanwilliam Div.: Cederberg, Langberg, *Esterhuysen* 7312; Nieuwoudt Pass, *Stokoe* in S. Afr. Mus. Herb. 61961; Tafelberg, *Esterhuysen* 8082; Wolfberg, *Esterhuysen* 22460.—Worcester Div.: Bonteberg, *Compton* 9952; Eikenbosch Hoek, *Esterhuysen* 3680 (type, in Bolus Herb.).

The remarkably broad bases of the leaves and very deeply concave upper portion of the outer involucral scales distinguish this species from all others with untwisted leaves.

10. **M. langebergensis** *Salter in Journ. S. Afr. Bot.* xii, 90 (1946)!

A rigid shrublet up to 60 cm. high, lanate on the branchlets. Leaves mostly 5—7 mm. long, rather crowded, narrowly linear, mucronate, closely involute, at first sparsely lanate beneath, twisted, spreading or declinate, with small leaves in the axil. Corymbs usually 1·5—2 cm. wide, hemispherical, dense, obscurely branched. Capitula 6—7 mm. long, shortly pedunculate, cylindrical, 5-flowered. Outer involucral scales in 4 or 5 series, oblong-lanceolate, acute, submembranous, closely imbricate, bound together with silky hairs except at the erect-spreading apex, enlarging inwards, reaching to the upper half of the involucre. Inner scales in 3 series, linear- or oblanceolate-oblong, acute or obtuse, with a distinctly exserted pale pink portion. Pappus bristles serrulate, distinctly widened above the middle into a subclavate, obtuse portion. Corolla 3·5—4 mm. long, linear, red in the upper half, with narrowly deltoid lobes.

Ladismith Div.: Roodeberg Pass, *Barker* 5498, *Norris* 232.—Mossel Bay Div.: Robinson Pass, *Hops* 126.—Riversdale Div.: summit of Garcia's Pass, *Salter* 6771 (type, in Bolus Herb.).

This species is one of the *muricata* group and is allied to *M. aurea* and *octoflora* from which it is distinguished by the inner involucral scales never being very obtuse or truncate.

11. **M. erectifolia** sp. nov.; fruticulus diffusus ramulis gracilibus lanatis dense foliatis; folia erecta imbricata linearia attenuata mucronata dorsaliter glabra stricta axillis nudis; capitula 3-fl. tubulo-obconica; involucri squamae 5-seriatae, exteriores lineari-lanceolatae sparse ciliatae, interiores spathulatae obtusae apice dentatae albae; pappei setae superne sensim latae.

A much branched shrublet about 30 cm. high with wiry closely leafy lanate branches. Leaves 6—9 mm. long, linear, tapering to a mucro, concave and with woolly hairs above, involute at the margins, slightly keeled, rugose and glabrous beneath, closely set, straight, untwisted, erect, imbricate, without leaflets in the axil. Corymbs about 1·5 cm. wide, hemispheric, compact, shortly branched, subtended by leaves.

Capitula 5—6 mm. long, tubular-obconic, 3-flowered, crowded. Outer involucral scales in 3 series, reaching to well above the middle of the capitulum, linear-lanceolate, acute, papery, sparsely ciliate with long silky hairs. Inner scales in 2 series, spathulate, obtuse ± toothed at the apex, erect, white. Pappus bristles slender and minutely toothed below the middle, distinctly widened and penninerved towards the obtuse apex. Corolla cylindric, with narrowly deltoid lobes. Achenes cylindric, terete, scabridous.

Riversdale Div.: near Still Bay, limestone hills. *Esterhuysen* 19527 (in Bolus Herb.).

A distinct species without any close affinity. It is distinguished from all others by the linear, erect and imbricate leaves.

12. **M. Schlechteri** *L. Bolus in Ann. Bolus Herb.* iv, 111 (1927)!

A rigid shrublet probably about 30 cm. high, with ascending lanate branchlets. Leaves 2 mm. long, closely set, linear-oblong, subacute, mucronulate, closely involute, glabrous beneath, twisted, ± declinate, mostly with small leaves or a short branchlet in the axil. Corymbs mostly 0·6—1 cm. wide, obconic, very shortly and obscurely branched. Capitula 0·8—1 cm. long, usually 16—18 in a corymb, cylindric, free, 3—5-flowered, subtended by one or more oblong-lanceolate, untwisted leaves. Outer involucral scales in 4 or 5 series, lanceolate, acute, erect, clothed and bound together with white tomentum except at the apex; the outermost about 2 mm. long; the remainder lengthening inwards and reaching to the middle of the capitulum. Petaloid scales in 4 series, linear- or oblanceolate-oblong, very acute, erect, concave, sparsely lanate on the dorsal face about the middle, white. Pappus bristles serrulate in the lower half, very slightly widened and barbellate towards the acute apex. Corolla 4—5 mm. long, slender in the lower half, gradually widened upwards, with lanceolate lobes.

Paarl Div.: Bain's Kloof, *Schlechter* 10243 (type, in Bolus Herb.).

Notable features are the very short leaves, erect, very acute petaloid involucral scales, barbellate pappus bristles and unusually narrow corolla lobes. There is a possible affinity with *M. muricata* R.Br.

13. **M. rhoderoides** *Salter in Journ. S. Afr. Bot.* xii, 91 (1946)!

A diffusely branched, slender-wiry shrublet usually 30—45 cm. high with woolly-tomentose branchlets sometimes pink towards the ends. Leaves usually 0·5—1 cm. long, lanceolate or oblong-lanceolate, acute, mucronate, with a raised nerve and cobwebby- or woolly-tomentose beneath, expanded or half-involute, twisted, erect-spreading, with a tuft of small leaves in the axil. Corymbs usually 1—1·5 cm. wide, very shortly and obscurely branched, hemispheric, clothed with pink woolly

hairs beneath, subtended by 4 or 5 linear, untwisted and appressed leaves. Capitula 4·5—5 mm. long, cylindric in the lower half, hidden by woolly hairs, slightly widened in the exposed upper half, 3- or 4-flowered. Outer involucral scales in 3 or 4 series, linear, subulate-acuminate, covered, except at the tips, by a dense mass of woolly cilia. Petaloid scales in 2 or 3 series, linear or oblanceolate-linear, acute, straight, white. Pappus bristles serrulate, slender in the lower half, slightly widened towards the acute apex. Corolla 2·5 mm. long, oblong in the lower half, slightly narrowed from the middle upwards, with narrowly deltoid lobes. Achenes obconic-oblong, scabridous, with minute longitudinal ridges, with a disk of minute pale scales at the apex.

Paarl Div.: Wellington Sneeuwkop, *Esterhuysen* 13000; shale band between Bailey's Peak and Pic Blanc, *Esterhuysen* 8524, 22766; Bailey's Peak, *Esterhuysen* 8524, *Stokoe* 8161, in S. Afr. Mus. Herb. 5771; Upper Witte River Valley, *Adamson* 4924, *Esterhuysen* 8681 (type, in Bolus Herb.); Limietberg, *Esterhuysen* 1601.—Worcester Div.: Slanghoek Mts., Cossacks, *Esterhuysen* 8620; near Bain's Kloof, San Sebastian's Kloof, *Stokoe* in S. Afr. Mus. Herb. 57772.

14. **M. riparia** *Salter in Journ. S. Afr. Bot.* xii, 92 (1946)!

An erect shrub 1·5—2·5 m. high with erect, woolly-tomentose and rather densely leafy branches. Leaves mostly 0·7—1 cm. long, linear-lanceolate, acute, mucronate, scabridous and, at first, lanate beneath, involute, twisted, erect-spreading, with a tuft of many small leaves in the axil. Corymbs mostly 6—8 mm. wide, crowded in inflorescences mostly 2·5—3·5 cm. wide, closely bound together with matted woolly hairs, subtended by 1—3 foliaceous bracts. Capitula 4—5 mm. long, cylindric, subtended by 1 or 2 linear scales with acute brown tips and long woolly hairs on the margins. Outer involucral scales in 3 or 4 series, linear, acute or subacute, glabrous, white, half as long as the inner. Petaloid scales in 2 or 3 series, linear or linear-oblong, obtuse or subacute, erect, white, with narrow membranous wings on the lower half. Pappus bristles serrulate, oblanceolate towards the apex. Corolla 3 mm. long, tubular, with narrowly deltoid lobes. Achenes oval, minutely papillose, with narrow longitudinal striae.

Caledon Div.: Palmiet River Mts., *Stokoe* in S. Afr. Mus. Herb. 61965; mountain at Onrust River, *Esterhuysen* 4922; Palmiet River Mouth, streamside, *Levyns* 5333, *Esterhuysen* 12617, 13696, *Salter* 5179 (type, in Bolus Herb.); Platteberg and Paardeberg, *Stokoe* 9075.

15. **M. confusa** sp. nov.; fruticulus diffusus ramulis gracilibus lanatis dense foliatis; folia erecto-patentia lanceolata vel oblanceolata acuta dorsaliter pilosa torta, axilis gemmiferis; capitula 4—5-fl. oblonga in

glomerulis dense tomentosis aggregata; involucri squamae 6-seriatae, exteriores lineares acuminatae, interiores lineares vel lanceolato-vel oblanceolato-lineares acutae vel obtusae albidae; pappi setae usque ab initio latae, superne leviter concavae.

An erect shrublet 30—50 cm. high, with wiry lanate branches. Leaves crowded, mostly 0·7—1 cm. long, lanceolate and tapered to the base or oblanceolate, acute, with a slender mucro, conspicuously nerved and with shaggy hairs beneath, very slightly involute at the margins, twisted, erect-spreading, with a tuft of small leaves in the axil. Inflorescence composed of 1—3 corymbs on tomentose branchlets. Corymbs mostly 0·7—1 cm. wide, very compact, very shortly and obscurely branched, clothed with matted, pink woolly hairs, subtended by several untwisted small leaves. Capitula 5—6 mm. long, closely bound together with woolly hairs, 4—5-fld. Outer involucral scales in 3 series, linear, with acuminate tips exserted above the woolly hairs arising on the back and margins. Petaloid scales in 2 or 3 series, linear, lanceolate- or oblanceolate-linear, acute or obtuse, erect, white. Pappus bristles distinctly widened from the base, conspicuously lanceolate and slightly concave towards the acute apex. Corolla 3—5 mm. long, cylindric, slightly tapered towards the base, with narrowly deltoid lobes.

Caledon Div.: Kogelberg, *Compton* 16859, 16864, *Leighton* 877 (type, in Bolus Herb.); Grabouw, *Stokoe* in S. Afr. Mus. Herb. 56992; Palmiet River, *Stokoe* 8730, in S. Afr. Mus. Herb. 56991; Buffels Mt., *Pillans* 8268; Platteberg and Paardeberg, *Stokoe* 9073; near Palmiet River Mouth, *Esterhuysen* 12568.

This species is allied to *M. rhoderoides* Salter from which it is distinguished by the shaggy hairs on the lower surface of the leaves, by the branching of the inflorescence, and by the widening of the pappus bristles from the base up to the conspicuously lanceolate, slightly concave upper portion.

16. **M. Bolusii** *L. Bolus in Ann. Bolus Herb.* iv, 112 (1927)!

A divaricately branched shrublet usually 40—60 cm. high, with rigidly wiry, densely leafy, lanate branchlets. Leaves mostly 5—8, rarely 3, mm. long, acicular, acute, pungent-mucronate, closely involute, at first sparsely villous beneath, twisted, ± declinate, with conspicuous tufts of small leaves in the axil. Corymbs 1·3—1·8 cm. wide, hemispheric, very compact, shortly and obscurely branched, with many leaves appressed against the under surface. Capitula 5 mm. long, narrowly obconic, 3—5-flowered, bound together by woolly hairs at the base, subtended by a slightly longer oblanceolate-linear bract. Involucral scales in 3 series, papery, white; the outer oblanceolate-linear, acute or obtuse, as long or almost as long as the inner; the inner 5 or about 5, oblanceolate,

obtuse or some acute, occasionally toothed, rarely united up to the middle. Pappus bristles serrulate, with a linear or oblanceolate distinctly nerved and toothed upper portion. Corolla 3 mm. long, cylindric in the lower half, widening gradually upwards, with deltoid lobes. Achenes elliptic, with longitudinal ridges.

Cape Div.: Mamre Road, 23 miles from Cape Town, *Compton* 18148. —Malmesbury Div.: Yzerfontein, *Compton* 7937; near Darling, *Henrici* 3742; near Pella, *Levyns* 9416.—Paarl Div.: Hercules Pillar, *Levyns* 8957.—Piquetberg Div.: 3 miles north-west of Sauer, *Acocks* 14533; 2—3 miles south of Sauer, *Lewis* in S. Afr. Mus. Herb. 62730.

This species closely resembles one of the forms of *M. Cephalotes* from which it is distinguished by the involucre-like arrangement of leaves appressed to the under surface of the corymbs.

17. **M. adunca** *Less. Syn.* 341 (1832); *DC. Prodr.* 253 (1836) excl. syn. omn.; *Harv. in Harv. & Sond. Fl. Cap.* iii, 268 (1864) excl. *Thunb.*; *Levyns in Fl. Cape Penin.* 794 (1950).

A much branched shrub up to 1 m. high, with ascending wiry branches lanate on the younger parts. Leaves usually 5—7 mm. long, linear, mucronate, with involute margins, slightly recurved at the apex, at first sparsely lanate beneath, erect-spreading, untwisted, without leaves in the axil. Corymbs usually 1—1·5 cm. wide, compact, shortly branched. Capitula 6—7 mm. long, cylindric in the lower half, widening upwards, with several leaf-like bracts at the base, 4- or 5-flowered. Outer involucral scales oblanceolate, very obtuse, membranous; the lower partly covered with woolly hairs; the upper glabrous. Petaloid scales in three series, scarcely twice as long as the outer, oblong, very obtuse, cartilaginous, white. Pappus bristles slender, serrate, distinctly widened and penni-nerved near the apex. Corolla about 3·5 mm. long, widening gradually from the base. Achenes oblong, with 2 lateral, 3 dorsal and 3 ventral angles.

Caledon Div.: Genadendal, mountains of Baviaans Kloof, *Burchell* 7858.—Cape Div.: Bellville, *Compton* 5352; between Paarden Island and Blueberg, *Drège*; flats near Constantia, *Mundt* 10; south base of the Tigerberg, *Pillans* 4755; flats south of Mamre, *Lewis* in S. Afr. Mus. Herb. 62728.—Ceres Div.: Elands Kloof, *Compton* 16146, 20981.—Clanwilliam Div.: Grey's Pass, *Schlechter* 10761; *Lewis* in S. Afr. Mus. Herb. 61967; Nardouw, *Barker* 4751, *Maguire* 1044, *Salter* 7533, *Stokoe* in S. Afr. Mus. Herb. 61966.—Malmesbury Div.: Hopefield, *Bolus* 12714; near Mamre, *Levyns* 8959.—Paarl Div.: Kraaifontein, *Esterhuysen* 14556.—Piquetberg Div.: few miles west of Sauer, *A. M. Wilman* 863, *Steyn* 551.—Robertson Div.: McGregor, *Walgate* 334.

18. **M. Bodkinii** *L. Bolus in Ann. Bolus Herb.* iv, 110 (1927)!

A diffusely branched shrublet about 15 cm. high, with slender-wiry branches densely tomentose on the upper parts. Leaves mostly 4—6 mm. long, narrowly obovate, tapering towards the base, acute, apiculate, clothed with dense persistent tomentum above and beneath, slightly involute in the upper half, half-twisted, erect-spreading, with or without small leaves in the axil. Corymbs 1—1·2 cm. wide, hemispheric, dense, unbranched. Capitula 6—7 mm. long, cylindric, sessile, 5-flowered. Outer involucral scales of two kinds; the outermost leaf-like, linear, acute, densely tomentose, half as long as the capitulum; the inner slightly longer, lanceolate, acute, tomentose on the back, bound together with hairs. Petaloid scales 6—6·5 mm. long, in two series, linear or oblanceolate-linear, acute, erect-spreading, spreading or somewhat recurved in the upper half, white. Pappus bristles serrulate, widened towards the distinctly obtuse apex. Corolla 3 mm. long, gradually widened from the base, with narrowly deltoid lobes.

Caledon Div.: Zwartberg, *Bodkin* in Bolus Herb. 6915.

Form b. Branchlets unevenly tomentose. Leaves oblanceolate, mucronate, distinctly involute, half-twisted, glabrous beneath. Capitula 5·5—6 mm. long, subtended by a linear modified leaf. Outer scales linear-lanceolate, very acute, glabrous on the back. Petaloid scales lanceolate, white with a transverse pink band at the middle.

Caledon Div.: near summit of Houwhoek Peak, *McNae* 1090, in S. Afr. Mus. Herb. 59566.

There may be some affinity with *M. quinqueflora*, but the petaloid scales are much fewer and in fewer series. The type of this species may represent an unusually woolly form.

19. **M. quinqueflora** *DC. Prodr.* vi, 254 (1837); *Harv. in Harv. & Sond. Fl. Cap.* iii, 269 (1864).

A diffusely branched shrublet usually 15—20 cm. high, with slender ± tomentose branchlets. Leaves mostly 5—7 mm. long, acicular, mucronate, involute, tomentose above, with scattered silky hairs beneath, twisted once or almost so, with or without leaves in the axil. Corymbs mostly 0·7—1 cm. wide, closely and shortly branched. Capitula 5—6 mm. long, oblong, widened above the middle, 5-flowered, clasped by several amply ciliate leaves at the base. Outer scales about 3, reaching to shortly above the middle of the involucre, lanceolate, acuminate, with a dense covering of long silky hairs on the lower half. Petaloid scales in 3 or 4 series, oblong-oblanceolate or spathulate, obtuse, dorsally rounded, erect-spreading towards the apex, white or rarely pink. Pappus bristles serrate in the lower half, distinctly widened and penninerved in the

upper half, very obtuse. Corolla 4 mm. long, widened from the base, with narrowly deltoid lobes.

Caledon Div.: Hottentots Holland Mts., *Mundt* 12; mountains above Palmiet River, *Ecklon* 313; Palmiet River Mouth, *Barker* 6080, *Compton* 12368, 14100, *Esterhuysen* 23349, *Gillett* 602, *Levyns* 5356, 5391; Elgin, *Compton* 14529, *Leighton* in Bolus Herb. 25246, *Stokoe* 8163, 8727, in S. Afr. Mus. Herb. 61945, 61946; Paardeberg, *Adamson* 4902, *Stokoe* 9074, 9091; Grietjes-gat, *Ecklon* 471; Kleinmond, *Cuthbert* in Univ. Cape Town Herb. 8606.

The notable characters of this species are the unusually dwarf habit, the very slender leaves and the constancy of the number of flowers in the capitula.

20. **M. tenuifolia** *DC. Prodr.* vi, 253 (1837); *Dietr. Fl. Univ. N. Folge* t. 55 (1849); *Harv. in Harv. & Sond. Fl. Cap.* iii, 269 (1864). **M. erubescens** *DC. Prodr.* vi, 254, excl. var.; *Harv. l. c.* excl. var.

A diffusely branched rather slender shrublet usually 2—3 dm. high, with ± unevenly dispersed tomentum on the branchlets. Principal leaves usually 6—8 mm. long, linear or oblanceolate-linear, mucronate, tomentose above, glabrous beneath or rarely clothed with matted hairs on both sides, twisted once or almost so, erect-spreading or somewhat declinate, mostly without small leaves in the axil. Corymbs usually 0·8—1·3 cm. wide, densely branched. Capitula 4—5 mm. long, oblong, subsessile, 3-flowered, subtended by several foliaceous scales. Outer scales linear or oblong, bound together with closely woven hairs; the inner reaching to the middle of the capitulum. Inner scales in 3 or 4 series, oblong-oblanceolate, acute, subacute or obtuse, erect, slightly incurved at the apex, minutely apiculate, with silky hairs on the lower margins, pink or almost white. Pappus bristles serrate throughout, slightly to considerably widened above the middle. Corolla 3·5—4 mm. long, widened above the middle, with deltoid lobes.

Caledon Div.: Caledon Baths, *Ecklon* 475 (syntype of var. *rigidula* DC. in S. Afr. Mus. Herb.); Swartberg, *Ecklon* 316, *Esterhuysen* 18949, *Galpin* 4161; Shaw's Mt., *Compton* 10604; Grabouw, *Andreae* 1080, *Bolus* 4143, *Compton* 16526; Bot River, *Schlechter* 9456; Viljoen's Pass, *Gillett* 697, 4452; Elgin, *Levyns* 2292, 3330, *Stokoe* in S. Afr. Mus. Herb. 61963; Palmiet River at Elgin, *Schlechter* 5418, *Stokoe* in S. Afr. Mus. Herb. 57710; Houwhoek, *Bolus* in Herb. Norm. Austr-Afr. 1184, 1185, *Guthrie* 2262, *Schlechter* 5484; Donkerhoek Mt., *Burchell* 7947; hills west of Bot River Lagoon, *McNae* 1099.

This species is retained with some doubt because of its close affinity with *M. seriphiifolia* DC., mostly in the leaf characters. A conspicuous character is the uneven distribution of tomentum on the branchlets.

21. **M. muricata** *R. Br. in Trans. Linn. Soc.* xii, 124 (1817); *D. Don, Mem. Wern. Soc.* v, 557 (1826); *Less. Syn.* 336 (1832); *DC. Prodr.* vi, 250 (1837); *Harv. in Harv. & Sond. Fl. Cap.* iii, 270 (1864); *Sim, Forest Flora of Cape Colony*, p. 247, t. 87 (1907); *Marloth in Deutsch. Tiefsee-Exped.* 1898-99, ii, 111, 101, t. 6 (1908); *Levyns, Guide to Fl. Cape Peninsula*, fig. 187 (1929), in *Fl. Cape Penin.* 193 (1950). [**Elichrysum africanum** etc. *Sieber, Thes.* ii, 37, t. 36, f. 6 (1735).] **Gnaphalium fruticosum** etc. *Burm. Pl. Rar. Afr.* 221, t. 79, f. 1 (1738); *Berg. Pl. Cap.* 262 (1767); *Linn. Syst. Veg. ed. Gmelin* ii, pars 1, p. 1213 (1796) excl. *Burm. f.* 2, 3. **Gnaphalium muricatum** *L. Sp. Pl.* 852 (1753) excl. vars.; *Berg.* l. c. excl. vars. partim; *Thunb. Prodr.* 148 (1800); *Willd. Sp. Pl.* iii, 1856 (1804); *Pers. Syn. Pl.* ii, 416 (1807); *Thunb. Fl. Cap. ed. Schultes* 644 (1823). **G. fasciculatum** *Lam. Encycl. Meth.* ii, 745 (1786). **G. fastigiatum** *Thunb.* l. c.; ej. *Fl. Cap.* 645. **G. polyanthos** *Thunb. Prodr.* 147!, ej. *Fl. Cap.* 643. **G. umbellatum** *Schrank in Denkschr. Akad. Muench.* viii, 161 (1824). **Metalasia umbellata** *Cass in Dict. Sc. Nat.* xxx, 223 (1826) non *Don.* **M. fastigiata** *Don in Mem. Wern. Soc.* v, 557 (1826). **M. polyanthos** *Don.* op cit. p. 558.

A rigid much branched shrub usually 1·5—2·5 m. high, rarely attaining 4 m., lanate on the young growth. Leaves usually 6—8 mm. long, narrowly oblanceolate or linear, acute, mucronate, tomentose above, glabrous or almost so beneath, involute, usually ± twisted once, spreading or ± declinate, often slightly incurved, with a tuft of leaves or a small branchlet in the axil. Corymbs usually 2—4 cm. wide, convex above, densely much branched. Capitula 5—5·5 mm. long, on short lanate peduncles, oblong, widened above the middle, 3—5-flowered. Outer involucral scales 1—3 mm. long, in several series, oblong-lanceolate or oblanceolate, acute or obtuse, minutely apiculate, closely imbricate, bound together with marginal hairs. Petaloid scales 6 or 7 in 3 series, narrowly spathulate, acute, scarious, white, somewhat spreading, considerably exceeding the outer. Pappus bristles very slender, slightly widened above the middle, serrulate. Corolla about 3 mm. long, slightly widened from the base, purplish on the upper half, with ovate-deltoid lobes. Achenes ovate-oblong, 3-sided, with a prominent ventral ridge and a small cup-shaped apical disk.

Caledon Div.: Landdrost Kop, *Stokoe* 6573.—Cape Div.: near Wynberg, *W. Dod* 227; Devil's Peak, *Bolus* 25219; Table Mt., Lower Plateau, *Esterhuysen* 21702; Table Mt., north slopes, *Barker* 5585, *Shantz* 50; Lion's Head, *Smith* 2914; Camp's Bay, *Humbert* 9406, *Levyns* 1448, 1449, *Marriott* 9, *Moss* 4124; Kirstenbosch, *Levyns* 1446; Salt River, *Marloth* 156; Wynberg, *Burchell* 883; between Wynberg and Constantia, *Burchell* 791; Hout Bay, *Compton* 9161, *Shantz* 10; between Little Lion's

Head and Karbonkelberg, *Levyns* 1452, 6048; flats near "Steenberg", *MacOwan* in Herb. Norm. Austro-Afr. 118; Skoorsteenkop, *Acocks* 653, *Levyns* 5845; St. James, *Marriott* 11; Noordhoek, *Levyns* 1450; Muizenberg, *Guthrie* 969, 970, *Levyns* 6223; Kalk Bay, *Moss* 3721; Fish Hoek, *Hutchinson* 148, *Moss* 3723; Rooihoogte, *Levyns* 5645; Sirkels Vlei, *Levyns* 5647, 5656; Smitswinkel, *Leighton* 1061, *Morris* 96, *Moss* 3720; Cape Flats, *Barker* 1535, 1537, *Guthrie* 401, *Humbert* 9373, *Letty* 274, *Levyns* 8951, *Moss* 3721, *Pillans* 1904, *Schlechter* 690; near road south of Mamre, *Levyns* 3265; Blaauwberg Strand, *Barker* 5367.—Piketberg Div.: Sauer, *Wilman* 733.

The above description, based on Bolus 25219, is of the commonest form on the Cape Peninsula and most probably the form used by Linnaeus when describing his *Gnaphalium muricatum*. The following forms are those which may be distinguished most readily from each other and from the typical form as described above. The following forms are those with the most distinctive characters. None of them, however, is without some variation which connects it with one or more of the other forms.

Form b. Leaves long-pointed, pungent. Outer involucral scales considerably tapered, aristate, pungent, loosely imbricate. Inner scales acute or acuminate, erect. **M. pungens** *Don in Mem. Wern. Soc.* v, 558 (1826); *DC. Prodr.* vi, 251 (1837). **M. aristata** *DC.* op cit. 250. **M. muricata** var. **aristata** et **pungens** *Harv. in Harv. & Sond. Fl. Cap.* iii, 250, 251 (1864).

Caledon Div.: River Zonder Einde Mts., *Middlemost* 1522, *Stokoe* in S. Afr. Mus. Herb. 61978.—Knysna Div.: Keurbooms River, *Barnard* in S. Afr. Mus. Herb. 48278.—Ladismith Div.: Barrydale, *Hutchinson* 1100.—Laingsburg Div.: Witteberg, south slopes, *Compton* 2618, 2815. —Montagu Div.: Keur Kloof, *Compton* 8744.—Mossel Bay Div.: Gouritz River Bridge, *Barker* 7929.—Oudtshoorn Div.: Gamka Pass, *Esterhuysen* 17133; Kamanassie, *Zinn* in S. Afr. Mus. Herb. 54406; south slopes of Zwartberg Pass, *Salter* 3130.—Prince Albert Div.: Zwartberg, *Esterhuysen* 9411, *Stokoe* 8732, 9076, in S. Afr. Mus. Herb. 57007, 61977, 61984.—Robertson Div.: Boesmans Kloof Pass, *Esterhuysen* 4482; between McGregor and Storms Vlei, *Esterhuysen* 4460.—Uniondale Div.: Blaauwbosch Berg, *Fourcade* 3150; Lauterwater, *Compton* 4543; Avontuur, *Fourcade* 2074.

Form c. Leaves pungent-mucronate. Outer involucral scales acuminate, squarrose and reflexed, tawny. **M. stricta** *Less. Syn.* 336 (1832); *DC. Prodr.* vi, 251 (1837). **M. Dregeana** DC. l.c.

Ceres Div.: Michell's Peak, *Esterhuysen* 15218.—Clanwilliam Div.:

Cederberg, *Stokoe* in S. Afr. Mus. Herb. 56623; Warm Baths, *Stephens* in Percy Sladen Mem. Exped. 6959; Middelberg, *Esterhuysen* 7854; Pakhuis Pass, *Esterhuysen* 7393; Modderfontein, *Schlechter* 7963; Olifants River Mts., *Esterhuysen* 15300.—Malmesbury Div.: Riebeek Kasteel Mt., *Pillans* 6105.—Paarl Div.: Drakenstein Mts., *Bolus* 4039; Paarl Mt., *Drège* in S. Afr. Mus. Herb. 17715; Dal Josaphat, *Tyson* 863.—Piketberg Div.: De Hoek, *Compton* 19464, *Lewis* in S. Afr. Mus. Herb. 61948.—Stellenbosch Div.: Somerset West, *Parker* 3460.—Worcester Div.: Brandvlei Berg, *Esterhuysen* 4379.

Form d. Leaves often 2·5—3 mm. long. Outer involucral scales lanceolate in the upper half, acute, recurved. Inner scales usually spreading in the outer series. **M. Massoni** S. Moore in Journ. Bot. xxxvii, 372 (1899)!

Humansdorp Div.: Konga Hills, *Esterhuysen* 6684; Rietvlei, *Esterhuysen* 6616b.—Oudtshoorn Div.: Outeniqua Mts., near Moeras River, *Esterhuysen* 19465.—Riversdale Div.: Garcia's Pass, *Steyn* 305.—Uniondale Div.: Konga Mts., *Esterhuysen* 6684, 6983, 10813, 16242, 16322; Slypsteenberg, *Esterhuysen* 6326.

Form e. Stems and leaves clothed with a dense covering of woolly hairs. Outer involucral scales tipped with a long slender awn. **M. lanceolata** var. **tomentosa** *DC. Prodr.* vi, 251. **M. muricata** var. **tomentosa** *Harv.* op cit. 271.

Caledon Div.: River Zonder Einde Mts., *Middlemost* 1533; Happy Valley, *Barker* 917; Zwartberg, *Bodkin* in Bolus Herb. 6914; between Elgin and Villiersdorp, *Salter* 3317.—Ceres Div.: Roodeberg, *Compton* 8447.—Cape Div.: Noordhoek Mt., *Barker* 2078.—Clanwilliam Div.: base of the Tafelberg, *Esterhuysen* 21364.—Paarl Div.: French Hoek, *Stokoe* in S. Afr. Mus. Herb. 61943; Seven Sisters Mt., *Esterhuysen* 15801.—Worcester Div.: Waaihoek Mts., *Barnard* in S. Afr. Mus. Herb. 45665; Matroosberg, *Esterhuysen* 14209, *Dyke* in Marloth Herb. 4553; Hex River Mts., Prospect Peak, *Esterhuysen* 15932; Waaihoek, *Esterhuysen* 8881.

Form f. Leaves lanceolate or elliptic, mucronate, with the upper surface mostly exposed, often without a tuft of leaves in the axil. **M. phylicoides** *Don in Mem. Wern. Soc.* v, 559 (1826); *DC. Prodr.* vi, 250 (1837). **M. muricata** var. **phylicoides** *Harv. in Harv. & Sond. Fl. Cap.* iii, 271 (1864).

Bredasdorp Div.: Appels Kraal, *Stokoe* 9388; Frikkies Bay, *Compton* 18187; Pearly Beach, *Maguire* 10, 44; Strandkloof, *Compton* 21967.—

Caledon Div.: River Zonder Einde Mts., *Esterhuysen* 18760, *Stokoe* in S. Afr. Mus. Herb. 61955, 61982, *Zeyher* 2902. [All specimens seen are from young plants which grew in a burnt area.]

Form g. Leaves usually obovate, expanded, with narrowly involute margins.

Bredasdorp Div.: Franskraal, *Leighton* 1886.

Form h. Leaves mostly twisted twice or more. Outer involucral scales with a prominent, dorsally rounded, acute apex.

Caledon Div.: Rooiels, *Stokoe* in S. Afr. Mus. Herb. 61952; Hawston, limestone hill, *Leighton* 406; Palmiet River Valley, *Stokoe* in S. Afr. Mus. Herb. 61953.

Form i. Stems slender-wiry. Leaves narrowly linear, apiculate, with very closely involute margins, often without leaves in the axil.

Bredasdorp Div.: Elim, *Bolus* 6913, in Bolus Herb. 25220.—Paarl Div.: Kraaifontein, *Dümmer* 1532.

Form j. Branchlets, leaves and capitula shorter than in other forms. Leaves 2—3 mm. long. Involucres 6 mm. long. Outer petaloid scales dark reddish-brown on the upper half. **M. capitata** *Less. Syn.* 337 (1832) excl. syn. Lam.; *Harv. in Harv. & Sond. Fl. Cap.* iii, 268 (1864). **M. erocoides** *Sieber ex DC. Prodr.* vi, 253 (1837).

South Africa: without precise locality: *Ecklon* 467, *Sieber* 17.—Malmesbury Div.: Paardeberg, south side of the summit, *Pillans* 6325; 1 mile north of Malmesbury, *Salter* 4488; Berg River at Goudini, *Esterhuysen* 20159.

Form k. Leaves oblanceolate, more than half expanded, very incurved, untwisted, with conspicuous axillary tufts of small leaves. Petaloid involucral scales mostly very obtuse, emarginate.

Bredasdorp Div.: Bredasdorp, *Dix* in S. Afr. Mus. Herb. 41929; The Poort, *L. Bolus* in Bolus Herb. 20541, *Esterhuysen* 19134, 19573; Kathoek, *Pillans* 9366; Baardscheerdersbosch, *Stokoe* in S. Afr. Mus. Herb. 61941.

This form is only known to grow on limestone formation. The leaves are unlike those of any other species.

The following records are of the species as a whole excluding those given above:

South Africa: without precise locality: *Cooper* 1522, *Ecklon* 482, 485, *Sieber* 17, *Sim* 2750, *Tom* 466, 494, *Zeyher* 309.—**Basutoland.**—without precise locality: *Cooper* 704; Leribe, *Dieterlen* 257; Putsna Mts., *Esterhuysen* 13214.—**Cape Province**—Albany Div.: near Grahams-

stown, *Barker* 567, *Britten* 5398, *MacOwan* 596, *Rogers* 1503, *Schönland* 539, *Wilson* S.A. 122; Stone's Hill, *Dyer* 458, 459, *Schönland* 3151; Dassie Krantz, *Dyer* 38; Howieson's Poort, *Britten* 2566; between Riebeek East and Grahamstown, *Burchell* 3507; Alicedale, *Cruden* 249.—Alexandria Div.: north of Nananga Store, *Story* 1303.—Bathurst Div.: Port Alfred, *Edwards* 186, *Levyns* 3783, *Salisbury* 8.—Bredasdorp Div.: near Bredasdorp, *Dix* in S. Afr. Mus, Herb. 41929, *Esterhuysen* 19134; "Sandhoogte", *Smith* 4298, 4304; "Rietfontein"; *Smith* 3159; "Soetendalsvlei", *Smith* 3099; Brandfontein, *Smith* 3125; Springfield Estate, *Stokoe* in S. Afr. Mus. Herb. 61980; "Kathoek", *Pillans* 9493; Potteberg, *Compton* 19546, *Pillans* 9503; near Pearly Beach, *Maguire* 35, 43, 60; flats near Frikkie's Bay, *Compton* 18212; Bontebok Park, *Compton* 21923, 21926; Ratel River, *Compton* 14758.—Caledon Div.: "The Baths", *Levyns* 4385, *Purcell* in S. Afr. Mus. Herb. 46169, *Smith* 2592; Houwhoek, *Bolus* in Bolus Herb. 25228, *Schlechter* 7768, *Smith* 4227, 4230; *Zeyher* 2899; near Villiersdorp, *Story* 3044; Elgin, *Lewis* in S. Afr. Mus. Herb. 61983, *Smith* 2547; Mossel River, *Pole-Evans* 458; Rooi Els, *Stokoe* 6574; Kleinmond, *Stokoe* in S. Afr. Mus. Herb. 61981; Klein River Mts., *Ecklon* 484, *Stokoe* in S. Afr. Mus. Herb. 61979; Landdrost Kop, *Stokoe* 6573; near Storms Vlei, Dasberg, *Stokoe* in S. Afr. Mus. Herb. 61978; between Somerset Sneeuwkop and Dwarsberg, *Stokoe* 8733, in S. Afr. Mus. Herb. 57004, 61973; flats east of Viljoen's Pass, *Stokoe* in S. Afr. Mus. Herb. 61972; Hanglip Estate, *Stokoe* in S. Afr. Mus. Herb. 61970; Paardeberg, *Stokoe* in S. Afr. Mus. Herb. 61942; Genadendal, *Levyns* 4843; "Grietjesgat", *Ecklon* 480; "Appel's Kraal", *Ecklon* 483; "Rooskraal", *Esterhuysen* 2651; Shaw's Mt., *Lewis* in S. Afr. Mus. Herb. 52823; Stettynsberg, *Esterhuysen* 11083; River Sonder Einde Mts., *Wilman* 508; Skilpad Kop, *Stokoe* in S. Afr. Mus. Herb. 37005; Kogelberg, *Compton* 18942, *Leighton* 2481; Happy Valley, *Barker* 916; near Danger Point, *Maguire* 10, 11; near Villiersdorp, Kaaiman's Gat, *Compton* 8803; "Highlands", *Compton* 13492; Mossel River, *Compton* 23639; Donkergat Mt., *Burchell* 8001; between Genadendal and Donkergat, *Burchell* 7933.—Calvinia Div.: between Van Rhynsdorp and Nieuwoudtville, *Maguire* 151.—Ceres Div.: Karooport, *Marloth* 9053; Zwart Ruggens, "Kat Bakkies", *Levyns* 1841; Matroosberg, *Levyns* 965; Elands Kloof, *Levyns* 6416; Cold Bokkeveld, *Esterhuysen* 21292.—Clanwilliam Div.: Heerenlogement, *Compton* 10963; Cederberg, *Esterhuysen* 7872, *Marloth* 2716, *Stokoe* in S. Afr. Mus. Herb. 61971; "Boontjies Vlei", *Stokoe* in S. Afr. Mus. Herb. 57003; Krom River, *Stokoe* in S. Afr. Mus. Herb. 61975; Elands Kloof, *Levyns* 4893, 4907; Pakhuis Pass, *Esterhuysen* 5905, 21765, *Stokoe* in S. Afr. Mus. Herb. 57002; Pakhuis Mts., *Esterhuysen* 21765; Tafelberg, *Barnard* in S. Afr. Mus. Herb. 44110, *Esterhuysen* 7873;

Skurfdeberg, *Primos* in S. Afr. Mus. Herb. 45697; Sneeuwkop, *Compton* 6167; Matjes River, *Wagener* 260; Juriesberg, *Compton* 6166.—East London Div.: coast at East London, *Galpin* 3306, *Gane* 305, *Rattray* 55; Gonubie, *Compton* 17042, *Townsend* in Moss Herb. 18801.—George Div.: George, *Bolus* in Bolus Herb. 25230, *Moss* 6882, *Rogers* 11966; near source of Keurbooms River, *Burchell* 5092; hills at Kamanassi, *Fourcade* 5578, *Stokoe* in S. Afr. Mus. Herb. 54378, *Zinn* in S. Afr. Mus, Herb. 54406; "Hooge Kraal", *Fourcade* 4122, *Hutchinson* 1288; top of Montagu Pass, *Hutchinson* 1199; Great Doorn River, *Thorne* in S. Afr. Mus. Herb. 51683; Wilderness, *Levyns* 802, 5005.—Herschel Div.: without precise locality, *Gerstner* 36; near Telle River, *Gerstner* 131. Sterkspruit, *Hepburn* 354.—Humansdorp Div.: Humansdorp, *Galpin* 4160, *Rogers* 2904; 5 miles west of Humansdorp, *Fourcade* 3031; hills at Zuur Anys, *Fourcade* 4933; dunes west of Jeffrey's Bay, *Fourcade* 3956; Essenbosch, *Fourcade* 5837; "Tuschen Bij", *Fourcade* 476; Clarkson, *Thode* A887; "The Glen", *Burtt-Davy* 12077; Assegaibosch, *Levyns* 5585 —Kentani Div.: hills at the coast, *Pegler* 54.—King William's Town Div.: Keiskama Hoek, *Story* 3498.—Knysna Div.: Goukamma, *Fourcade* 3927; dunes east of Keurboom River, *Compton* 21686, *Fourcade* 228, *Hutchinson* 1374; Plettenberg Bay, *Kapp* 11; Hoogeberg, *Keet* 1060; Concordia, *Kapp* 62; "Forest Hall", *Duthie* 742; Woodville, *Tyson* in S. Afr. Mus. Herb. 17714; Knysna Heads, *Michell* in Bolus Herb. 16121 between Knysna and Plettenberg Bay, *Levyns* 4991.—Komgha Div.: Cape Morgan, *Flanagan* 177.—Ladismith Div.: Seven Weeks Poort, *Barnard* in S. Afr. Mus. Herb. 46299, *Levyns* 2340, *Pole-Evans* 19120H; Toverkop, *Esterhuysen* 13931; hills near Ladismith, *Levyns* 2073, 2699. —Maclear Div.: Pomona, Ugie, *Gill* 253.—Malmesbury Div.: Mamre, *Baur* 1178; Hopefield, *Letty* 45; Berg River Bridge, *Barker* 4070; Yzerfontein, *Barker* 3824.—Montagu Div.: Montagu, *Moss* 5353; Cogman's Kloof, *Levyns* 31; Keisiesberg, *Compton* 18496, *Levyns* 8081, 8084; Eendracht, *Lewis* in S. Afr. Mus-Herb. 61976; between Montagu and Triangle, *Michell* 31.—Mossel Bay Div.: Robinson's Pass, *Maguire* 797; between Mossel Bay and George, *Burtt-Davy* 12585.—Namaqualand: Sneeuwkop, upper west slopes, *Pearson* and *Pillans* in Percy Sladen Mem. Exped. 5794; Rietkloof Mt., *Pearson* in Percy Sladen Mem. Exped. 5693; Spektakel, *Rev. Morris* in Bolus Herb. 25229.—Oudtshoorn Div.: Zwartberg Pass, *Levyns* 6649; Meiring's Poort, *Stokoe* in S. Afr. Mus. Herb. 61974; Roodeberg, *Acocks* 14626, *Levyns* 6065, 6625; near Cango Caves, *Atherstone* 264.—Paarl Div.: Bain's Kloof, Kies 26, *Levyns* 5146; Hermon, *Salter* 4639; Klein Drakenstein Mts., *Galpin* 11073; Haalhoek Spitzkop, *Esterhuysen* 15714; Wemmershoek, *Andreae* 803, *J. C. Smuts* 1119; Wemmers-

hoek Peak, *Esterhuysen* 11337, *Stokoe* in S. Afr. Mus. Herb. 61958; French Hoek, *Bond* 360, *Phillips* 1165; Witte River Valley, *Thorne* in S. Afr. Mus. Herb. 46542; Paardekop, *Esterhuysen* 11590.—Piketberg Div.: Piketberg, *Esterhuysen* 20135, *Guthrie* 2613; between Berg River and Sauer, *Barker* 5819, *Wilman* 733.—Port Elizabeth Div.: Port Elizabeth, *Ethel West* 96, *I. L. Drège* 686, *Pole-Evans* 18276H; Aerodrome, *Long* 39; Redhouse, *Paterson* 496; Schoenmakers Kop cliffs near the sea, *Theron* 228; Vaal Vlei Estate, *Mogg* 4667; Zwartkops River, *Zeyher* 2898.—Prince Albert Div.: Seven Weeks Poort, north slopes, *Primos* 77; Zwartberg, *Barnard* in S. Afr. Mus. Herb. 48186, *Bolus* 11541; Blaauwkop, *Stokoe* 9076; Klaarstroom, *Levyns* 6613.—Queenstown Div.: Hanglip Mt., *Galpin* 1624.—Riversdale Div.: Riversdale, *Smith* 2776; Zandhoogte, *Muir* 369; Garcia's Pass, *Barker* 7369, *Esterhuysen* 17011; "Zoetmelksvlei", *Burchell* 7575; Still Bay, *Barker* 7354, 7361.—Robertson Div.: Poesjenets River, *Levyns* 5440.—Somerset East Div.: Zuurberg, above Ann's Villa, *Acocks* 12032; near Sanatorium, *Schönland* 3228; Boschberg, *Levyns* 5575; mountain above the spring at Commadagga, *Burchell* 3336.—Stellenbosch Div.: Stellenbosch, *Zeyher* 2899; between Stellenbosch and Cape Flats, *Burchell* 8373; Ida's Valley, *Levyns* 1112, 1113; Somerset Strand, *Parker* 3703; Gordon's Bay, *Gerstner* 6170; Jonkershoek, *Morris* 77, *Pillans* 6801; Lourens River Valley, *Parker* 3703; Sir Lowry's Pass, *Galpin* 3515, *Guthrie* 2354.—Stockenstrom Div.: Katberg, *Baur* 519, 878, *Compton* 6576, *Pole-Evans* 1752.—Stutterheim Div.: Fort Cunnynham, *Sim* 2028.—Swellendam Div.: near Swellendam, *Smith* 2725; Tradouw Pass, *Walgate* in Bolus Herb. 25231; Zuurbrak, *Burtt-Davy* 12554, *Galpin* 4158; Anysberg, *Esterhuysen* 17323; near Heidelberg, Lemoenshoek Mts., *Stokoe* in S. Afr. Mus. Herb. 61969; White Sands, *Walgate* 880; "Goedgeloof" Mt., *Wurts* 81b.—Tulbagh Div.: Tulbagh Station, *Guthrie* 2353, *Marloth* 5601; Nieuwe Kloof, *MacOwan* in Herb. Norm. Austro-Afr. 1888; Great Winterhoek, Sneeuwgat Valley, *Phillips* 1763.—Uitenhage Div.: Uitenhage, *Ecklon* 79; Olifants Hoek, *Zeyher* 2900; Van Staadens, *Ecklon* 278, *Paterson* 2471, between Uitenhage and Van Staadens, *Schönland* 3258, 3259.—Uniondale Div.: Lauterwater, *Compton* 4543; Blaauwbosch Berg, *Fourcade* 5328; Ratelbosch, *Fourcade* 335; Kamnassi Hills, *Fourcade* 5226; Zitsikama Mts., north slopes, *Esterhuysen* 16847; hills at Misgund, *Fourcade* 5328; hills near Avontuur, *Fourcade* 2074; 8 miles west of Uniondale, *Acocks* 16029; Outeniqua Mts., near Joubertina, *Esterhuysen* 13585.—Van Rhynsdorp Div.: Giftberg, *Esterhuysen* 22022.—Willowmore Div.: Asvogelberg, *Marloth* 14144; mountains west of Miller Station, *Andreae* 1024.—Worcester Div.: Kavadouw Mts., *Esterhuysen* 10310; "Tweedside",

Marloth 10837; Pieter Meintjes, *Marloth* 9963; Du Toit's Kloof, *Marloth* 637; Matroosberg, *Gillett* 3610, *Marloth* 2221; Sonklip Peak, *Esterhuysen* 18719a; Audensberg, *Compton* 9769; Keeromsberg, *Esterhuysen* 9267; Prospect Peak, *Esterhuysen* 15413, 17323; Witteberg, *Barker* 7471, *Esterhuysen* 9475, *Marloth* 2970; Cabidu, *Barker* 6776; Slanghoek Mts., *Esterhuysen* 16538, 19983.—Griqualand East: Matatiele, mountain-top, *Galpin* 14258, in Bolus Herb. 25257; New Amalfi, *Forbes* 1127; Ingeli Mt., *Tyson* 1444, 1453; Mount Fletcher, *Sim* 2535.—Natal: Drakensberg, Polela, *Evans* 524; National Park, *Hutchinson*, *Forbes* and *Verdoorn* 25; Cathkin Area, *Esterhuysen* 7946; Cathedral Peak Forest Research Station, *Killick* 1710; Cathedral Peak Area, *Esterhuysen* 10229; Little Tugela Area, *Esterhuysen* 8832; slopes of Tseketseke, *Levyns* 8259.—**Orange Free State:** Bethlehem Div.: near Kestell, Pont 1079C; Signal Hill, *Potgieter* 26; Marquard, *Nicholson* 3234; Zastrom, summit of mountain, *Heydorn* 9.—Ficksburg Div.: Fouriesburg, *Rogers* 15903; Ficksburg, *Fowkes* 190.—Harrismith Div.: without precise locality, *Smit* 121; Harrismith, *Sankey* 166.—**Transvaal:** Ermelo Div.: Athole P. R. Station, *Acocks* 11705.—Lydenburg Div.: Blyde, "Lisbon", *Liebenberg* 3553; West Zoutpansberg, south face, "Crewe Farm", *Hutchinson* and *Gillett* 4445.

This species has the widest geographical and ecological range, and is the most abundantly represented in herbaria. Some of the many forms have conspicuous characters and at first appear to merit separation as species or varieties, but when an extensive range of material, comprising most of the grades of intermediate and marginal forms, is examined it becomes evident that such a classification would obscure the real relationship of these forms; it would be misleading and it would increase the difficulties of separation. Harvey realized that "The more numerous the specimens examined the less possible is it to distinguish the varieties from one another". The characters used for distinguishing between the above forms differ in degree and value depending on individual interpretation. They are not always local, but where they are and the conditions of soil and climate are known it seems probable that the edaphic factor is largely responsible for the origination of the more significant characters.

22. **M. aurea** *D. Don in Mem. Wern. Soc.* v, 558 (1826); *DC. Prodr.* vi, 250 (1837); *Dietr. Fl. Univ. N. Folge* t. 55 (1849); *Harv. in Harv. & Sond. Fl. Cap.* iii, 270 (1864).

A much branched shrub 35—60 cm. high with thickly lanate branchlets. Leaves usually 1—1·5 cm. long, linear, closely involute, sharply mucronate, twisted, at first sparsely lanate beneath, erect-spreading,

spreading or somewhat declinate, with many small leaves in the axil. Corymbs 1·5—2 cm. wide, compactly branched. Capitula 5—6 mm. long, tapering cylindric, 4- or 5-flowered. Outer involucral scales in about 6 series, lanceolate, mucronate, erect, bound together with hairs on the lower half. Petaloid scales in three series, shortly exserted, oblong-spathulate, very obtuse, concave, minutely lacerate and apiculate at the apex, with distinct membranous margins on the exserted portion, dull yellow. Pappus bristles slender, serrulate except at the narrowly clavate apical portion. Corolla 3·5 mm. long, distinctly widened in the upper half.

Without precise locality, *Mundt* in Nat. Herb. Pretoria 12833, *Ecklon* 312, *Zeyher* 2896.—Fort Beaufort Div.: Fort Beaufort, *Ecklon* 470.—Humansdorp Div.: hills near Humansdorp, *Fourcade* 1363, *Levyns* 3787, *Story* 2480; 11 miles west of Humansdorp, *Acocks* 13675; Geelhoutboom River, *Fourcade* 2223; Gamtoos River, *Zeyher* in S. Afr. Mus. Herb. 38512; Cambria, *Compton* 23470.—Laingsburg Div.: Witteberg, foothills, *Marloth* (a doubtful record).—Port Elizabeth Div.: Cradock Place, downs, *Galpin* 6350; near Port Elizabeth, Vaal Vlei Estate, *Mogg* 4646; Port Elizabeth, *Cruden* 431, *Tyson* 2185; Baakens River, *Long* 38; Green Bushes, *Holland* 3841; Walmer, *Paterson* 563; Theescombe, *Rogers* 28595.—Uitenhage Div.: road between Uitenhage and Van Staadens, *Schönland* 3253; Elands River, *Zeyher* 867, 933, 2896.

23. **M. juniperoides** sp. nov.; fruticulus diffusus, ramulis adscendentibus tomentosis; folia patentia vel adscendentia torta acicularia acuta arcte involuta, dorsaliter glabra, axilis plerumque gemmiferis; capitula cylindracea; involucri squamae 6-seriatae, exteriores lanceolatae lanatae, interiores oblanceolatae lanatae breviter exsertae pallidae; pappi setae serrulatae, superne subclavatae.

A diffuse shrublet 20—30 cm. high with slender ± lanate branchlets. Leaves mostly 0·6—1 cm. long, acicular, acute, mucronate, closely involute, lanate above, rugulose and glabrous beneath, ± angular on the lower half, erect-spreading or spreading, half or completely twisted, with or without small leaves in the axil. Inflorescence 5—8 mm. wide, obconic, compact, unbranched, overtopped by several subtending leaves. Capitula 5 mm. long, 3—5 in an inflorescence, subsessile, cylindric, usually 5-flowered. Involucral scales in 6 series, closely imbricate; the outer lanceolate, acute, apiculate, mostly clothed with appressed long woolly hairs; petaloid scales in 2 series, shortly exserted, erect, oblanceolate, acute, glabrous, pale cream. Pappus bristles subclavate towards the obtuse apex, serrulate. Corolla linear except at the tapered base, with narrowly deltoid lobes.

Clanwilliam Div.: Elands Kloof, west end, *Esterhuysen* 4205 (type, in Bolus Herb.), *Stokoe* in S. Afr. Mus. Herb. 61957; Zandfontein, *Compton* 19443; Keerom, rocky hills near west bank of Olifants River, *Esterhuysen* 17872.

A very distinct species. The appearance of the capitula suggests a possible affinity with *M. muricata* R.Br.

24. **M. gnaphalodes** *Druce in Bot. Soc. and Exchange Club of Great Britain*, suppl. 2, p. 635 (1917). **Stoebe gnaphalodes** *Thunb. Fl. Cap. ed. Schultes* 726 (1823) excl. syn. omn. **Metalasia lanceolata** *DC. Prodr.* vi, 251 (1837) partim, excl. var. β.

A much branched shrub usually 60—70 cm. high with wiry ascending branches loosely lanate on the upper parts. Leaves very variable, mostly 6—9 mm. long, lanceolate, linear-lanceolate or linear, rarely oblanceolate, oblong or cymbiform, acute, mucronate, broad-based, with a prominent dorsal nerve, transversely rugose, glabrous and shiny beneath or at first with silky and woolly hairs, erect-spreading or ascending, untwisted, usually with a tuft of small leaves in the axil. Corymbs mostly 1·5—2·5 cm. wide, compact and distinctly or indistinctly branched. Capitula 6 mm. long, cylindric, slightly widened towards the apex, 3-flowered. Outer involucral scales in 4 or 5 series, linear-lanceolate, attenuate, erect, occasionally very slender and spreading towards the apex, reaching well up to the upper half of the involucre. Petaloid scales in 2 or 3 series, narrowly oblanceolate-oblong, acute or obtuse, occasionally emarginate, white or pink. Pappus bristles very slender in the lower half, narrowly linear in the upper, serrulate. Corolla widened slightly from the base, with narrowly ovate lobes. Achenes linear-oblong, with longitudinal ridges, scabrid.

Without precise locality, *Drège* in S. Afr. Mus. Herb. 45054, *Cooper* 1532, *Thom* 624, *Harvey* 804, *Zeyher* 2895.—Albany Div.: without precise locality, *Cooper* 1522, *Story* 2264; Grahamstown, *MacOwan* 597, *Zeyher* 2894; Dassie Krantz, *Dyer* 37; Atherstone, *Rogers*, sine num.—George Div.: George, flats, *Gillett* 2080; hills east of Great Brak River, *Fourcade* 6005; top of Montagu Pass, *Walgate* 207, *Martin* 94; west side of Kaymans River, *Burchell* 5796.—Humansdorp Div.: Loerie, *Dix* 218; hills above Clarkson, *Fourcade* 4952, *Thode* A 886; Karreedouw, *Thode* A 885; Assegaibosch, *Levyns* 5586.—Knysna Div.: Plettenberg Bay, *Smart* in Herb. Rogers 27878; between Plettenberg Bay and Knysna, "Melkhout Kraal", *Burchell* 5376; Rabbits Eiland Kop, *Phillips* 133; Knysna, *Newdegate* in S. Afr. Mus. Herb. 17713; "The Crags", *Compton* 23589; Paardekop, *Compton* 23567; near the Heads, *Michell* in Bolus Herb. 16121, *Levyns* 7875; "Kaatje's Kraal", near Yzer, *Burchell* 5260.

—Ladismith Div.: Swartberg, near Ladismith, *Esterhuysen* 13949, *Levyns* 2072, 2701, 6105, 7396, 9046; Touwsberg, *Levyns* 7461; Buffels Poort Berg, *Levyns* 7418; Prins Poort Berg, *Levyns* 6161; Roodeberg, *Barker* 6185, *Levyns* 6066.—Laingsburg Div.: Witteberg, *Compton* 2982.—Mossel Bay Div.: Robinson Pass, *Compton* 19605; Cloete's Pass, *Levyns*.—Oudtshoorn Div.: Swartberg, slopes and hills east of the pass, *Pocock* S. 218, *Steyn* 268, *Stokoe* in S. Afr. Mus. Herb. 61944.—Port Elizabeth Div.: towards Witteklip Canyon, *Rodin* 1046; Loerie Plantation, *Dix* 218.—Riversdale Div.: without precise locality *Stokoe* in S. Afr. Mus. Herb. 61985; Garcia's Pass, *L. Bolus* in Bolus Herb. 25226, *Levyns* 2708, *Smith* 2756; Langeberg, near Riversdale, *Esterhuysen* 17023; above "Phisantefontein", *Muir* 3134; Kampscheberg, *Muir* 4492; Still Bay, *Muir* 440.—Uitenhage Div.: between Galgebosch and Milk River, *Burchell* 4784: Krakakama and Van Staadens, *Zeyher* 2895; Van Staadens Mts., *Ecklon* 315, *Long* 1368; Elands River, *Drège* 473.—Uniondale Div.: between Uniondale and Avontuur, *Levyns* 9624; near Joubertina, Die Hoek, *Esterhuysen* 16854, 16855, 22800; west of Lauterwater, Many Waters Kloof, *Compton* 5176; Long Kloof, near Avontuur, *Fourcade* 1324; Slypsteenberg, south slopes, *Esterhuysen* 6321; Ratelbosch, *Fourcade* 323.

Conspicuous features are the transversely rugose backs of the leaves and the very acute, acuminate or hair-like tips of the outer involucral scales.

25. **M. tricolor** sp. nov.; fruticulus diffusus ramulis sat gracilibus lanatis; folia linearia acuta involuta stricta erecto-patentia, dorsaliter sparse villosa, axilis plerumque gemmuliferis; capitula 6—7 fl., anguste obconica; involucri squamae 9—12 seriatae, exteriores lanceolatae, acutissimae, dorsaliter pilosae, interiores oblanceolatae albae; pappi setae superne conspicue latae nervosae.

A much branched shrublet about 50 cm. high, with wiry closely lanate branchlets. Leaves about 5 mm. long, linear, acute, mucronate, involute, slightly angular and at first very sparsely villous beneath, almost straight, erect-spreading, untwisted, mostly with a small branchlet in the axil. Corymbs 1·5—2 cm. wide, obconic, widely rounded above, distinctly branched. Capitula mostly 8 mm. long, narrowly tubular-obconic, 6—7-flowered, without subtending leaves. Involucral scales in 9—12 series. Outer scales lanceolate, very acute, cartilaginous, with long silky hairs on the back and margins, closely imbricate except for the almost erect, glabrous, light brown apical portion. Petaloid scales in 3 series, oblanceolate, erect-spreading towards the apex; the outer acute and pink; the inner obtuse and white. Pappus bristles slender and

denticulate in the lower half, considerably widened and penninerved towards the obtuse apex. Corolla almost straight-sided, with narrowly deltoid lobes.

Oudtshoorn Div.: Gamka Pass, *Esterhuysen* 17127 (in Bolus Herb.).

The affinity is possibly with *M. muricata* R.Br. The distinguishing characters are the untwisted leaves and the involucral scales being arranged in a greater number of series.

26. **M. octoflora** *DC. Prodr.* vi, 250 (1837)!; *Harv. in Harv. & Sond. Fl. Cap.* iii, 272 (1864). **M. xanthocephala** *Salter in Journ. S. Afr. Bot.* xii, 93 (1946)!

A rather rigidly wiry much branched shrub, usually 60—80 cm. high, with appressedly lanate branchlets. Leaves usually 0·7—1 cm. long, linear, acute or acuminate, mucronate, involute, twisted, glabrous or almost so beneath, erect-spreading, spreading or declinate, usually with small leaves or a short branchlet in the axil. Corymbs mostly 1—1·3 cm. wide, widely obconic, dense, unbranched. Capitula 6—7 mm. long, distinctly pedunculate, cylindric, slightly widened above the middle, 5—7-flowered. Outer involucral scales in about 5-series, linear, acute, mucronate, light brown, imbricate, progressively longer inwards, matted together with tangled hairs on the lower half, sparsely ciliate on the upper half. Inner scales shortly exserted, narrowly oblanceolate, very obtuse or subtruncate, minutely toothed and pale yellowish-brown at the apex. Pappus bristles slender, serrulate, widened and distinctly serrate towards the apex. Corolla about 4 mm. long, widened from the middle upwards. Achenes oblong-elliptic, subterete, scabrid.

Cape Div.: flats 2 miles north-east of Durbanville, *Pillans* 8529.—Malmesbury Div.: between Malmesbury and Hopefield, near Oude Post, *Salter* 4407 (type of *M. xanthocephala*, in Bolus Herb.); Kalabas Kraal, *Salter* 7179.—Paarl Div.: near Paarl, *Drège* in Kew Herb. (syntype); flats north of Paarl, *Compton* 18121; 1½ miles south-west of Joostenberg, *Pillans* 7618; between Mulder's Vlei and Phesant Kraal, *Salter* 4393.—Tulbagh Div.: near Wolseley, *Salter* 7301.

This species has a close affinity with *M. aurea* from which it may be distinguished by the unbranched corymbs, the greater maximum number of florets and the more distinctly serrate pappus bristles. And yet the two may be rather widely separated geographical forms of the same species.

27. **M. seriphiifolia** *DC. Prodr.* vi, 254 (1837)!; *Harv. in Harv. & Sond. Fl. Cap.* iii, 269 (1864). **M. erubescens** var. **rigidula** *DC.* l. c. **M. Cephalotes** *DC. Prodr.* vi, 252, non *Less.*, excl. syn. *Cass.*, *Thunb.* **M. nitidula** *Harv.* op. cit. 268. **M. concinna** *Harv.* op. cit. 271. **M. speciosa** *Hutch. in Ann. S. Afr. Mus.* ix, 380 (1917)!

A moderately branched shrublet usually 35—40 cm. high with striate, tomentose branchlets. Leaves usually 6—8 mm. long, sometimes 1—1·5 cm., acicular or oblanceolate-linear, mucronate, tomentose above, at first lanate beneath, involute, twisted once or rarely twice, spreading or somewhat declinate, with or without leaves in the axil. Corymbs usually 2—3 cm. wide, convex above, closely branched. Capitula 5—6 mm. long, on short lanate peduncles, narrowly oblong, 3—5-flowered. Outer involucral scales 2—3·5 mm. long, in several series, oblanceolate, obtuse or acute, bound together by marginal hairs on the lower parts, concave and glabrous above the middle. Petaloid scales in 3 or 4 series, lengthening inwards, oblanceolate or oblong-oblanceolate, obtuse or shortly acute, often apiculate, concave, with a short ridge behind the apex, glabrous, pink. Pappus bristles slender in the lower half, very slightly to distinctly widened towards the apex, serrate. Corolla about 3·5 mm. long, widened above the middle, with widely deltoid lobes. Achenes oblong, with distinct longitudinal ridges on the back.

Bredasdorp Div.: Bredasdorp Mt., *Galpin* 11298; Baardscheerdersbosch, *Leighton* 2594, *Stokoe* in S. Afr. Mus. Herb. 61950; near Elim, *Barker* 7780, *Bolus* 6912, 8555, *Schlechter* 9671.—Caledon Div.: Hawston Mt., *Compton* 3431, 10188, 22213, *Esterhuysen* 19603; Babylons Tower, *Zeyher* 2901 (syntype of *M. nitidula* in S. Afr. Mus. Herb.); between Kleinmond Road and Highlands, *Barker* 5883, *Leighton* in Bolus Herb. 25227; Hermanus, *Bolus* 9178, *Compton* 14261, *Galpin* 4157, *L. Guthrie* in Bolus Herb. 17974, *Oldridge* in Bolus Herb. 25245; Vogelklip, *Barker* 1754, *van Bruyn* 184; Mossel River, *Compton* 23649, *Potts* in S. Afr. Mus. Herb. 4986; Highlands, *Compton* 12257, 13491; between Gansbaai and Quoin Point, *Lewis* in S. Afr. Mus. Herb. 61951, *Stokoe* in S. Afr. Mus. Herb. 61960; Kleinmond, *Compton* 12814, *Isaac* in Bolus Herb. 25244, *Levyns* 7723; Shaw's Mt., *Barker* 49, 7198, *Compton* 23038, *Gillett* 4191; Platteberg, *Stokoe* in S. Afr. Mus. Herb. 61964; Mossel River, *Hegenbotham* 178; Onrust, *Adamson* 3078, *Gilmore* 2079, 2094, *Levyns* 5405; Paardeberg, *Levyns* 8760.—Clanwilliam Div.: without precise locality, *Mader* 44; Wupperthal, *Thode* A 2016; Keerom, *Esterhuysen* 17879, *Pillans* 8704; Warm Baths, *Stephens* in Percy Sladen Mem. Exped. 7009, 7010; Kradouw Krantz, *Pillans* in Percy Sladen Mem. Exped. 5313 (syntype of *M. speciosa* in S. Afr. Mus. Herb.); Nardouw Pass, *Barker* 4744, *Stokoe* in S. Afr. Mus. Herb. 56996; Lambert's Hoek Berg, *Compton* 22109; Elands Kloof, *Compton* 16756, *Stokoe* 7514, in S. Afr. Mus. Herb. 56995; between Clanwilliam and Lambert's Bay, *Lewis* in S. Afr. Mus. Herb. 61947; Uitkyk Pass, *Compton* 4788, 6168; Matjes River, *Wagener* 277; near Zeekoe Vlei, *Levyns* 1189, *Rennie* 2615; Pakhuis Pass, *Esterhuysen* 7396, 21928, *Johnson* 252, *Levyns* 3979, *Salter* 2703;

Cederberg, *Esterhuysen* 12128, *Pattison* in Bolus Herb. 14475, *Stokoe* 7513; Algeria Forest Station, *Galpin* 10551, *Story* 2955; Duivelskop, *Stokoe* in S. Afr. Mus. Herb. 56994; Henningvlei, *Stokoe* in S. Afr. Mus. Herb. 56993; Plassberg, *Leipoldt* 234; North Cederberg, Koupoort, *Esterhuysen* 12128; Pakhuis to Henning Vlei, *Esterhuysen* 21146.—Malmesbury Div.: Hopefield, *Letty* 34.—Paarl Div.: Bailey's Peak, west base, *Esterhuysen* 22369.—Piketberg Div.: Piketberg, *Compton* 3645; Mouton's Vlei, *Marloth* 11529, *Martin* 870, *Pillans* 7427; Kapiteins Kloof Mt., *Pillans* 7892; Het Kruis, *Stephens* and *Glover* in Percy Sladen Mem. Exped. 8655; Twenty-Four Rivers Mts., *Esterhuysen* 16119a, 21886.—Tulbagh Div.: at the waterfall, *Ecklon* 478, in S. Afr. Mus. Herb. 38534A; Tulbagh Road Station, *Guthrie* 2351; Steendaal, *Ecklon* in S. Afr. Mus. Herb. 38534b.—Van Rhynsdorp Div.: Giftberg, *Esterhuysen* 22017, *Phillips* 3373, 7401.

Small forms resemble *M. tenuifolia* DC. The widest pappus bristles are associated with the widest leaves. That is not uncommon in this genus.

28. **M. intermedia** *DC. Prodr.* vi, 253 (1837). **M. Rogersii** *S. Moore in Journ. Bot.* lviii, 77 (1920)!

A diffusely branched shrublet usually 30—35 cm. high, with slender, lanate branchlets. Leaves 2—3 mm. long, linear, acute, mucronate, closely involute, twisted, at first sparsely lanate above, mostly with a tuft of small leaves in the axil. Corymbs usually 0·7—1 cm. wide, indistinctly branched. Capitula 5—6 mm. long, cylindric, closely bound together with woolly hairs up to the middle, 3-flowered, subtended by a linear, untwisted leaf-like bract. Involucral scales in 4 series, spathulate, usually very obtuse; the outer reaching to about the middle of the capitulum; the inner with woolly hairs up to the expanded, deeply concave, pink or rarely white portion. Pappus bristles linear-lanceolate or widely lanceolate above the middle, acute or subacute, serrulate to near the apex. Corolla gradually widening upwards. Achenes oblong-elliptic, rounded at the base and apex, with longitudinal ridges, scabrid.

Bredasdorp Div.: "Brandfontein", *Smith* 3128; Zoetanysberg, *Smith* 5024.—Caledon Div.: Genadendal, mountains, *Bolus* 7392. *Schlechter* 9853; near Greyton, Paardekop, *Stokoe* in S. Afr. Mus. Herb. 57773; River Zonder Einde Mts., *Esterhuysen* 18777, *Stokoe* 8859, in S. Afr. Mus. Herb. 57775, *Thorne* in S. Afr. Mus. Herb. 5808.—Ceres Div.: Michell's Pass, Slab Peak, *Esterhuysen* 6185; Neethlingsberg, *Esterhuysen* 22517; Michell's Pass, *Compton* 8142, *Pillans* 6788; near Tarantula Peak, *Esterhuysen* 21816; Ceres, *Rogers* 17557, 17620 (syntype of *M. Rogersii* in

Bolus Herb.), *Hutchinson* 581, *Levyns* 1073, 4670; Hansiesberg, *Compton* 16685; Castle Rocks, *Esterhuysen* 14700.—Piketberg Div.: above Porterville, *Esterhuysen* 16148.

Form B. Leaves mostly 0·5—1 cm. long, lanceolate-linear, loosely twisted, mostly without leaflets in the axil.

Ceres Div.: Olifants River Valley, Visgat, *Esterhuysen* 13410, *Stokoe* in S. Afr. Mus. Herb. 62729.

Possibly a shade-form with unusually large leaves.

There is very close affinity between this species and *M. brevifolia* from which it chiefly differs with a diffuse habit and with smaller indistinctly branched corymbs.

29. **M. Phillipsii** *L. Bolus in Ann. Bolus Herb.* iv, 111 (1927)!

A densely branched shrublet usually 25—35 cm. high, with glabrous or ± lanate branchlets. Leaves 2—3 mm. long, closely arranged, linear or oblong-linear, mucronate, broad-based, closely involute, twisted, glabrous or at first sparsely lanate beneath, with a tuft of small leaves in the axil. Corymbs usually 1—1·5 cm. wide, shortly and closely branched. Capitula 5—6 mm. long, cylindric, 3-flowered, subtended by 1 or 2 scale-like, ciliate bracts. Involucral scales in 5 or 6 series, with the exposed parts pink or rarely white; the outer reaching to about the middle of the capitulum, oblong, acute; the inner oblanceolate-oblong, shortly acute. Pappus bristles serrulate, very slightly widened at the apex. Corolla 3·5 mm. long, cylindric or widened up to the middle.

Ceres Div.: Matroosberg, *Davidson* in S. Afr. Mus. Herb. 38; near Laaken Vlei, *Phillips* 1892 (type, in Bolus Herb., syntype in S. Afr. Mus. Herb.); Roodeberg, *Stokoe* in S. Afr. Mus. Herb. 56985; Conical Peak, *Stokoe* 8160, in S. Afr. Mus. Herb. 56657; Baviaansberg, *Stokoe* in S. Afr. Mus. Herb. 52718, *Compton* 12848.

The affinity is with *M. intermedia* DC. from which it differs by the capitula not being bound together by long woolly hairs up to the middle, by the acute involucral scales and by the pappus bristles only being very slightly widened towards the apex. It may be suspected of being a high-mountain form of that species.

30. **M. incurva** sp. nov.; fruticulus densus, ramulis ascendentibus, junioribus sparse puberulis; folia oblonga obtusa vel acuta, basin versus ampliata, involuta incurva, dorsaliter sparse pilosa, axilis saepe gemmiferis; capitula 2—3-fl. cylindracea; involucri squamae ca. 7-seriatae oblongae acutae erectae roseae, exteriores ciliatae; pappi setae minutae serrulatae, superne inconspicue incrassatae.

A dense shrublet branched from the base, about 14 cm. high, with

comparatively stout, sparsely puberulous, ascending branches. Leaves 4—5 mm. long, oblong or subclavate from a wide decurrent base, shortly acute or obtuse, distinctly incurved, involute, tomentose above, ± rounded and, at first, with a few shaggy hairs beneath, untwisted, usually with a short branchlet in the axil. Corymbs mostly 1·5—2 cm. wide, hemispheric, distinctly branched, the branches clothed with mostly appressed shaggy hairs. Capitula 5—6 mm. long, cylindric, 2- or 3-flowered, unattached by hairs, subtended by several leaf-like bracts. Involucral scales in about 7 series, all similar except in size, shortly acute, erect, closely imbricate, pink; the outer oblong, with slightly glutinous cilia; the inner narrowly oblong, widening slightly towards the apex. Pappus bristles scarcely widened towards the acute apex, minutely serrulate. Corolla slightly widened from shortly below the middle upwards, with deltoid lobes.

Worcester Div.: Waaihoek Peak, *Esterhuysen* 8311, 15128 (type, in Bolus Herb.), 18188, *Stokoe* 7249, in S. Afr. Mus. Herb. 54529; Mt. Brodie, *Esterhuysen* 22212.

This species is distinguished by the untwisted, remarkably incurved, round-backed leaves which have an almost succulent appearance.

31. **M. cymbifolia** *Harv. in Harv. & Sond. Fl. Cap.* iii, 267 (1864)! **M. divergens** var. **nudiuscula** *DC. Prodr.* vi, 252 (1837). **M. decora** *L. Bolus in Ann. Bolus Herb.* iv, 112 (1927)!

A much branched wiry shrublet usually 40—50 cm. high, with copiously lanate ascending branches. Leaves usually 5—8 mm. long, oblanceolate, acute, mucronate, cymbiform, tapering towards the base, ± twisted or not twisted, ascending or spreading, often incurved, at first lanate beneath, becoming scabridous and shiny, with or without small leaves in the axil. Corymbs usually 1·5—2 cm. wide, mostly dense and obscurely branched. Capitula 6—7 mm. long, widest in the upper half, usually 2- or 3-occasionally 4-flowered, bound together by woolly hairs in the lower half, subtended by 1 or 2 acuminate densely woolly bracts reaching to the middle. Involucral scales in 3 or 4 series, oblong- or linear spathulate, acute or, the inner, obtuse, deeply concave at the apex and with a short keel and apiculus behind the apex, pale pink. Pappus bristles serrulate throughout, distinctly widened, linear-lanceolate in the upper portion, subacute. Corolla 4 mm. long, widening slightly towards the somewhat contracted mouth, with deltoid lobes.

Bredasdorp Div.: hills between Elim and Napier, *Bolus* 25256, *Guthrie* 3780; Baardscheerdersbosch, *Compton* 19021; Hagelkraal, *Compton* 20439.—Caledon Div.: Hermanus, *Bolus* 9179 (type of *M. decora*, in Bolus Herb.); Klein River Mts., *Stokoe* in S. Afr. Mus. Herb. 28389,

56983, 61939; mountains near Caledon, *Templeman* in S. Afr. Mus. Herb. 17706; Babylons Tower, *Zinn* in S. Afr. Mus. Herb. 53681; between Babylons Tower and Caledon, *Ecklon* 476 (syntype of *M. cymbifolia* in S. Afr. Mus. Herb.).

32. **M. Cephalotes** *Less. Syn.* 338 (1832) excl. syn. *Burm.: Harv. in Harv. & Sond. Fl. Cap.* iii. 266 (1864). **Gnaphalium muricatum var** *β* **capitatum,** b. **erectiusculum** *Berg. Pl. Cap.* 265 (1767). **Gnaphalium Cephalotes** *Thunb. Prodr. Cap.* 147 (1794); *Pers. Syn. Pl.* ii, 416 (1807); *Thunb. Fl. Cap.* ed. *Schulter* 643 (1823). **G. capitatum** *Thunb. Prodr. Cap.* 148; *Willd. Sp. Pl.* iii, 1897 (1804), *in Bull. Soc. Philom.* 47 (1819); *Thunb. Fl. Cap.* 646, non *Lam.* **Endoleuca pulchella** *Cass. in Dict. Sc. Nat.* xiv. 474 (1819). **E. sphaerocephala** *Cass.* op. cit. 475. **Gnaphalium glabrescens** *Schrank in Denkschr. Akad. Moench.* viii, 148 (1824). **Metalasia divergens** var. **purpurascens** *DC. Prodr.* vi. 252 (1837). **M. glomerata** *DC.* l. c. **M. muraltiaefolia** *DC.* op cit. 253. **M. rosea** *DC.* op cit. 252.

A sparsely or much branched shrublet usually 30—40 cm. high, rigid in the lower parts, with ascending tomentose branches. Leaves mostly 0·5—1 cm. long, crowded, lanceolate-linear, acute, pungent-mucronate, involute, at first lanate beneath, twisted, erect-spreading or somewhat declinate, with a tuft of small leaves in the axil. Corymbs usually 1·5—2 cm. wide, hemispheric, very compact, shortly branched. Capitula mostly 6—7 mm. long, narrowly cyathiform, 5-flowered, bound together with a dense covering of woolly hairs up to the middle. Outer scales in 1—3 series, linear, with ovate or lanceolate, acute or acuminate, pink or white tips reaching to the upper half of the capitulum. Petaloid scales in 4 series, erect, oblanceolate or subspathulate, acute or obtuse, the innermost often widely rounded and emarginate with a tooth in the sinus, often with narrow membranous wings on the lower half, white or with shades of pink. Pappus bristles linear-lanceolate or oblanceolate-linear towards the apex, serrulate throughout. Corolla slightly widened from the cylindric base, with narrowly deltoid lobes.

Without precise locality, *Marloth* 5850.—Bredasdorp Div.: Bredasdorp Mt., *Galpin* 10489; "Uintjieskuil", *Smith* 3187.—Caledon Div.: without precise locality, *Compton* 16521; Houwhoek, *Burchell* 8049; "Boontjes Kraal", *Zeyher* 469; Elands Kloof, *Galpin* 12304; Viljoen's Pass, *Pillans* 4805, *Stokoe* 8725, in S. Afr. Mus. Herb. 61934, 61935, *Story* 3052; Steenbras, *Rogers* 11020, *Stokoe* 9228; Landdrost Kop, *Stokoe* 6576; Sir Lowry's Pass, *MacOwan* in Herb. Austro-Afr. 1889, *Schlechter* 7224, *Stokoe* in S. Afr. Mus. Herb. 56990; Elgin, *Compton* 6426, *Stokoe* in S. Afr. Mus. Herb. 61938, 61962; Grabouw, *Bolus* 4147, *Stokoe* in S. Afr. Mus. Herb. 61937; Dwarsberg, *Stokoe* 8726, in S. Afr. Mus. Herb. 56998;

Nieuweberg, *Bond* 497; near Somerset Sneeuwkop, *Esterhuysen* 3526, *Stokoe* in S. Afr. Mus. Herb. 56604, 57000, 61932, 61933; Hottentots Holland Mts., Rooi Krantz, *Stokoe* in S. Afr. Mus. Herb. 56999.—Paarl Div.: French Hoek, *Bolus* 6999, 25224, *Louw* 159, French Hoek Pass, *Barker* 4912, *Taylor* 1494; Berg River Valley, near French Hoek, *Barnard* in S. Afr. Mus. Herb. 38546, 52342; Drakenstein Mts., near French Hoek, *Galpin* 12303, *Phillips* 1164; Berg River Hoek, *Compton* 8342, 13829, *Esterhuysen* 12396; La Motte Forest Reserve, *Compton* 5346, 5347, *Lewis* in Bolus Herb. 25221, 25222; Robert's Vlei, *Pillans* 6758; near Pniel, *Esterhuysen* 14048; Du Toit's Kloof, west entrance, *Maguire* 1115, *Pillans* 8416; Seven Sisters, *Esterhuysen* 9028; near Salem, Galpin in Bolus Herb. 25223.—Stellenbosch Div.: Banhoek Kloof, *Esterhuysen* 19896, *Stokoe* in S. Afr. Mus. Herb. 57711; Lourensford, *Parker* 3857, 3887, 4434; Jonkershoek Valley, *Esterhuysen* 17593, *Pillans* in Bolus Herb. 18755, *Rycroft* 989; Guardian Peak, *Esterhuysen* 11972; Pic Sans Nom, *Esterhuysen* 16722; Steenbras River Mouth, *Compton* 8017.—Worcester Div.: Bosjesveld Mts., *Stokoe* in S. Afr. Mus. Herb. 61956.

Form B. Diffuse or ascending after having been burnt, wiry or rigid in the lower half. Leaves linear. Corymbs usually 1·2—1·5 cm. wide. Petaloid involucral scales in 4 series, mostly white; the outer spreading slightly, acute or subacute, sometimes pale pink, the inner straight, obtuse or almost truncate and emarginate. **M. caespitosa** *Levyns* in Journ. S. Afr. Bot. viii, 260 (1942)!

Bredasdorp Div.: Bredasdorp, *Esterhuysen* 19155, *Galpin* 10489; Elim, *Bolus* 18705.—Caledon Div.: Knofflocks Kraal and Houw Hoek, *Zeyher* 477, *Schlechter* 5479; Hanglip, *Stokoe* in S. Afr. Mus. Herb. 61954; Zondags Kloof, *Compton* 10222; Hemel-en-Aarde, *Barker* 7613; Houwhoek, *Bolus* 5076, *Maguire* 1094; Aries Kraal, *Compton* 16481; Hermanus, *Bolus* 9689.—Cape Div.: Simon's Town Mts., *Levyns* 5313 (type, in Bolus Herb.), *Compton* 14014; Glencairn Mt., *Compton* 11596; Chapman's Peak, *Bond* 683, *Wasserfall* 694; between Wynberg and Constantia, *Burchell* 790, *Ecklon* 349, *Drège* in S. Afr. Mus. Herb. 38495; Tokai Flats, *Levyns* 5607; flats east of Mowbray, *Guthrie* 231, *W. Dod* 335; Kenilworth Flats, *Schlechter* 282; Cape Point, *Compton* 18294; Constantia Nek, *Barker* 3181; Vlakkeberg, *W. Dod* 1676; Constantiaberg, *Levyns* 7568; Kommetje, *Barker* 5896; Cape Point Reserve, *Leighton* 2320; near Paulsberg, *Lewis* in S. Afr. Mus. Herb. 61930; near Boys Kraal River, *Levyns* 7569; Bonteberg, *Levyns* 5427.—Stellenbosch Div.: Kuils River, *Pappe* in S. Afr. Mus. Herb. (sine num.); Sir Lowry's Pass, *Schlechter* 7252; Upper Lourens River Valley, *Parker* 3857.

All the specimens seen of this form were gathered from plants which had been burnt down to or near the surface of the soil.

Form c. Erect, rigid, much-branched, usually 30—50 cm. high. Leaves usually 7—9 mm. long, linear, erect-spreading, almost always completely twisted once. Capitula white, occasionally 6-flowered. Pappus bristles lanceolate-linear or linear and ± serrulate in the upper half, subacute or obtuse. **M. Cephalotes** *Levyns in Fl. Cape Penin.* 794 (1950)!

Cape Div.: slopes of the Muizenberg, *Bolus* 3906; on the Steenberg, *Pillans* 2987, *W. Dod* 1288; Olifants Bosch, *Levyns* 4951; plateau behind Witsands, *Esterhuysen* 12949; "Simon's Bay", *Milne* 102; hills west of Simon's Town, Grootkop, *Compton* 18030, *Stokoe* in S. Afr. Mus. Herb. 61931.

This form may be recognized by the erect habit and by most of the leaves being completely twisted. All the specimens seen appear to have been taken from unburnt plants.

Form d. Erect, rigid, with acicular tightly involute leaves. Corymbs 0·8—1 cm. wide, subtended by many leaves. Non-petaloid scales few; petaloid scales in 3 series, acute, obtuse or widely rounded, pale pink.

Cape Div.: "behind Wynberg", *Pappe* in S. Afr. Mus. Herb. 17705 partly; Cape of Good Hope Reserve, *Leighton* 2010.

This apparently distinct form is only known from burnt areas and may be abnormal in the vegetative parts.

Form e. Erect, slender-wiry. Leaves commonly 5—8 mm. long, reflexed. Corymbs usually 1—1·5 cm. wide. Outer involucral scales acute or acuminate, conspicuous, in several series, pale or dark brown. Petaloid scales in 3 series, mostly very obtuse, often pink.

Cape Div.: between Wynberg and Constantia Nek, *Wilms* 32651; slopes above "Kirstenbosch", *Hutchinson* 22; Constantiaberg, *Compton* 14149, 20376, *Levyns* 7563, *Schur* in Bolus Herb. 25275; Clovelly, *Compton* 13363, 18598; Noordhoek Mt., *Barker* 2086; source of Silvermine River, *W. Dod* 1285; hills west of the Muizenberg, *Pillans* 3246; on the Muizenberg Mts., *Bolus* 3907, *Levyns* 5414, *Schlechter* 1293, *Wilms* 3263; Llandudno, *Compton* 14823; St. James, *Moss* 7256; above Kalk Bay, *Levyns* 5414.

In appearance this form seems to be a link between the preceding and those that follow, some marginal variations not being easily placed.

Form f. Diffuse, with slender branches. Leaves usually 0·6—1 cm. long, loosely involute. Corymbs mostly 0·7—1·5 cm. wide. Non-petaloid scales few or absent. Petaloid scales in 2—4 series, mostly acute, the innermost obtuse, white.

Bredasdorp Div.: Bredasdorp Mt., *Esterhuysen* 19155; Elim *Bolus* 18705.—Caledon Div.: Houwhoek, *Maguire* 1094, *Schlechter* 5479;

Zondags Kloof, *Compton* 10222; Hemel-en-Aarde, *Barker* 7613; Aries Kraal, *Compton* 16481, *Leighton* 769; Elgin, *Stokoe* 8164; Palmiet River Valley, *Stokoe* 8723, in S. Afr. Mus. Herb. 57001; Onrust River, *Esterhuysen* 19269.

Some variations of this form closely approach the typical form of the species in habit of growth and characters of the involucral scales, while others approach variations of the following form.

Form G. A diffusely branched and comparatively slender shrublet with loosely involute usually declinate leaves. Corymbs mostly 0·8—1·5 cm. wide. Capitula 5—6 mm. long, with many brown outer scales. Petaloid scales in 2 or 3 series. Achenes widely oblong, widely rounded at both ends, somewhat dorsally compressed, with a longitudinal median ridge on the inner face, with 5 ridges on the outer face, all merging into a pale outgrowth at both ends. **M. divergens** *D. Don in Mem. Wern. Soc.* v, 557 (1826); *Less. Syn.* 339 (1832); *DC. Prodr.* vi, 252 (1837) excl. vars.; *Dietrich, Fl. Univ. N. Folge* t. 55 (1849); *Harv. in Harv. & Sond. Fl. Cap.* iii, 267 (1864) excl. var. γ; *Levyns in Fl. Cape Penin.* 794 (1950), [**Gnaphalium fruticosum** etc. *Burm. Afr. Pl.* 223, t. 79, f. 2 (1738).] **Gnaphalium muricatum** *L. Sp. Pl.* ii, 852 var. β (1753); var. **capititatum** forma a Berg *Pl. Cap.* 264 (1767). **Gnaphalium divergens** *Thunb. Fl. Cap.* ed. *Schultes* 645 (1823). **Helichrysum divergens** *Less. in Linnaea* vi, 223 (1831). **Metalasia depressa** *Harv.* loc. cit.! **M. divergens** *Eckl.* ex *Harv.* loc. cit.

Cape Div.: Table Mt., *Burchell* 25, *Ecklon* 53, *Forbes* 117, *Humbert* 9609, *MacGillivray*, sine num., *MacOwan* in Herb. Norm. Austro-Afr. 108, *Paterson* 84, *Penfold* 44, *Rogers* 3070A, *Tyson* 2364, 2996; summit of Table Mt., *Bolus* 4999, *Pappe* in S. Afr. Mus. Herb. 17707 (type of *M. depressa*), *W. Dod* 910; west slopes of Table Mt., *Barker* 3198, *Burchell* 387, *Ecklon* 310, *Levyns* 5205, *Moss* 8449, *Schonneberg* in Galpin Herb. 4900; Spring Buttress, *Stokoe* in S. Afr. Mus. Herb. 58402; Lower Plateau *W. Dod* 1571; Lion's Head, *Pillans* 3918; Devil's Peak, *Burchell* 8495, *Esterhuysen* 20324, *Guthrie* 378; "Kirstenbosch", *Esterhuysen* 17415, *Hutchinson* 22; Llandudno, *Compton* 14823, 16588.

The type of *M. divergens* was probably collected at the north base of Table Mt. Here the petaloid scales of the involucre are usually arranged in 2 series; at the west base of Table Mt. the number of petaloid scales is increased and they are arranged in 3 series; a little further southwards the number of series is invariably 3, and the size of the non-petaloid brown scales is much increased.

Form H. Very slender, diffuse and often decumbent. Leaves 4—6 mm. long, acicular, half- or completely twisted, spreading, with or without

small leaves in the axil. Corymbs 4—5 mm. wide, solitary. Capitula 5-flowered. Petaloid scales in 2 series, linear, scarcely widened upwards; the outer acute, often pale purple on the back; the inner obtuse, white. Pappus bristles clavate. **M. divergens** var. **gracilis** *Harv. in Harv. & Sond. Fl. Cap.* iii, 268.

Caledon Div.: Steenbras River Mouth, *Parker* 4016.—Cape Div.: Cape Peninsula, Bonteberg, *Compton* 9372.

This is the slenderest and apparently most depauperated form, resembling a growth-form of form G.

This multifarious species might be likened to a chain composed of long and short links, the former being the more numerous with more definite and fixed characters, the latter with indefinite characters and doubtful affinities. The same problems arise as in *M. muricata*. They concern the relative values of the various habits of growth, variations in the shape of the leaves and the size, shape and number of the involucral scales. It is not possible to account for these variations, whether they are due to differences in habitat or different genetic constitutions, without experimental evidence. The presence of marginal forms has prevented the preparation of a satisfactory key to the more significant forms which are described here. The distribution of the marginal forms is recorded with those with which they seem to have most affinity. The discernment of that affinity and the affinities throughout most of the genus has been difficult and often doubtful. It requires much intuitive comprehension and perhaps a faculty of divination.

33. **M. Barnardii** *L. Bolus in Ann. Bolus Herb.* iv, 112 (1927)!

A comparatively robust shrub usually 1—1·5 m. high with stout ascending branches and rigidly wiry, woolly-tomentose and densely leafy branchlets. Leaves mostly 0·8—1 cm. long, linear, acuminate, pungent-mucronate, involute, with a prominent dorsal nerve, at first with shaggy hairs on the back, ± twisted, sometimes twice, straight, erect-spreading, at length spreading, with a tuft of small leaves or a short shoot in the axil. Corymbs mostly 0·5—1 cm. wide, in an inflorescence usually 2·5—3·5 cm. wide, compact and much branched. Capitula 6—7 mm. long, narrowly cyathiform, 5-flowered, bound together with long woolly hairs. Outer scales in 2 series, linear, obtuse, apiculate, covered with long woolly hairs except at the apex, reaching to the upper half of the capitulum. Petaloid scales in 3 series, usually 1·5 mm. broad, oblong-lanceolate, very obtuse or rounded at the apex, emarginate, ± incurved and sometimes slightly undulate at the apex, rose-pink or almost white. Pappus bristles serrulate, widened from the middle to the conspicuously widened lanceolate apical part. Corolla 4 mm. long, slightly widened from the base, with narrowly deltoid lobes.

Ceres Div.: gorge west of Ceres, *Hutchinson* 618; mountains near Ceres, *Stokoe* 6578; Michell's Pass, Slab Peak, *Esterhuysen* 6160; Neethlingsberg, *Esterhuysen* 22537; peak east of Tarantula Peak, *Esterhuysen* 21846.—Paarl Div.: Wellington Sneeuwkop, *Barnard* in S. Afr. Mus. Herb. 28035 (type, in Bolus Herb.; syntype in S. Afr. Mus. Herb.); Wemmershoek Peak, *Esterhuysen* 11342, *Stokoe* in S. Afr. Mus. Herb. 56997; Witteberg, *Esterhuysen* 8675; Drakenstein mountains above French Hoek, *Galpin* 12302, *Pillans* 6746.—Worcester Div.: Bain's Kloof, *Levyns* 7613, *Compton* 17499, *Stokoe* in S. Afr. Mus. Herb. 61936; Witte River Valley, *Thorne* in S. Afr. Mus. Herb. 46526; Du Toit's Kloof, *Barnard* in S. Afr. Mus. Herb. 48617, *Esterhuysen* 15720; Waaihoek mountains, *Barnard* in S. Afr. Mus. Herb. 45666; Krom River Peak, *Esterhuysen* 9458; Slanghoek Pile, *Esterhuysen* 1719.

This species is clearly very closely related to *M. Cephalotes* from which it is distinguished by very much longer leaves, much larger inflorescence and by all the petaloid involucral scales being very obtuse.

IMPERFECTLY KNOWN SPECIES.

M. compacta *Zeyher ex Sch. Bip. in Flora* xxvii (1844).

M. cymosa *Cass. in Dict. Sc. Nat.* xxx, 223 (1826).

M. distans *DC. Prodr.* vi, 254 (1837). Possibly a form of *M. muricata R.Br.*

SPECIES EXCLUDED FROM METALASIA.

M. hispida *D. Don in Mem. Wern. Soc.* v, 557 (1826)=**Elytropappus spinellosus** *Cass.*

M. mucronata *R. Br. in Trans. Linn. Soc.* xii, 124 (1817)=**Helichrysum mucronatum** *Less.*

M. pulcherrima *Eckl. ex Harv. in Harv. and Sond. Fl. Cap.* iii, 280 (1864)=**Stoebe gomphrenoides** *Berg.*

M. rosmarinifolia *Sieber ex DC. Prodr.* vi, 166 (1837)=**Helichrysum diosmaefolium** *Sweet.*

M. seriphioides *R. Br.* l. c.=**Trichogyne seriphioides** *Less.*

M. umbellata *D. Don* op. cit. 556=**Lachnospermum umbellatum** *comb. nov.*

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INDEX OF PLANT NAMES

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THE TRANSVAAL ERICACEAE.

By I. C. Verdoorn.

(*National Herbarium, Pretoria.*)

ERICACEAE.

The Heath, Rhododendron and Bilberry Family.

Trees or shrubs, often low much-branched shrubs with very slender twigs. *Leaves* simple, entire or toothed, large and flat or small with revolute margins forming small solid subulate leaves, alternate or whorled, 3-, or more, nate. *Inflorescence* racemose or flowers solitary or fascicled to sub-umbellate. *Calyx* 4—5-partite or 4—5-lobed (rarely 3- or 2-lobed). *Corolla* gamopetalous, usually 4-lobed, rarely 5—10-lobed. *Stamen* usually 4 to 8, or 5 to 10, anthers 2-celled, cells opening by pores in the upper portion, often spurred or tailed. *Ovary* superior, 1—12-celled; ovules 1 or more in each cell. *Style* simple; stigma capitate or peltate. *Fruit* usually a small capsule, sometimes baccate or drupaceous.

The family is here treated as it is by Phillips in "Genera of S.A. Flowering Plants" (1951) retaining *Vaccinium* under Ericaceae, that is following the Engler system and not Hutchinson in "Families of Flowering Plants" (1926) who maintains the two families Ericaceae and Vacciniaceae, after the Bentham and Hooker system, that is as in Flora Capensis too.

KEY TO THE GENERA.

Ovary inferior; fruit baccate; leaves over 3 cm. long and 1 cm. wide, i.e. not ericoid .. .. 1. *Vaccinium*

Ovary superior; fruit a capsule; leaves small, up to about 1 cm. long, usually with margins revolute to form a small solid subulate leaf (i.e. ericoid):

Pedicels bracteate; calyx lobes more or less equal or if somewhat unequal the larger not overlapping the segments on each side .. .. 2. *Erica*

Pedicels ebracteate; 1 calyx lobe larger than the rest and overlapping them on both sides (i.e. outside in bud) corolla lobes inflexed .. .. 3. *Philippia*

1. VACCINIUM.

Linn., in Sp. Pl., ed. 1 : 349 (1753); Phillips in Gen. S.A. Fl. Pl. ed. 2 : 559 (1951).

Shrubs or *trees*. *Leaves* alternate, often lanceolate. *Inflorescence* racemose or flowers solitary or fascicled. *Calyx* with a short tube adnate in the lower portion to the ovary, 4—5-toothed or lobed. *Corolla* gamopetalous 4—5-lobed. *Stamens* twice as many as the corolla lobes. *Ovary* inferior, 4—5-celled. *Fruit* a globose berry with few to many seeds in each locule.

The genus occurs principally in the northern hemisphere, the best known species there being the Bilberry, *Vaccinium myrtillus* L., the Cowberry, *V. vitis-idoea* L., and the Cranberry, *V. oxyecocos* L.

V. exul *Bolus* in Hook. Ic. Pl. t. 1941 (1891); Brown in Fl. Cap. 4, 1 : 1 (1905); Hutchinson in A Botanist in Sthn. Africa, p. 351 (1944). *Vaccinium africanum* Britten in Trans. Linn. Soc. Ser. 2, 4 : 23 (1894).

Shrubs 3 to 12 ft. tall, branchlets sub-angular and somewhat sulcate when dry, rather thinly pubescent. *Leaves* rather coriaceous, lanceolate to ovate-lanceolate, 4—6 cm. long, 1—2 cm. broad, glabrous or pubescent on the midrib, serrate, acute, slightly cuneate or sub-rounded at the base, shortly petioled, petiole about 2—5 mm. long. *Raceme* axillary, shorter than or ultimately as long as the subtending leaf; pedicels about 5 mm. long, bracteate; bracts and bracteoles rather variable in size, usually 2—5 mm. long, broad and semiamplexicaule at the base, gradually narrowing to an acute or occasionally sub-obtuse apex, or bracteoles acuminate ciliate. *Flowers* white; calyx-tube united to the lower portion of the ovary, more or less 2 mm. long, glabrous, lobes sub-triangular

from a broad base, about 1 mm. long and 1·5 mm. broad at the base. *Corolla* about 7 mm. long, oblong urceolate; tube about 5 mm. long, slightly narrowed at the throat; lobes about 1·5 mm. long, spreading to recurved. *Stamens* 10, filaments linear, more or less 2·5 mm. long, pilose; anthers about 4·5 mm. long, cells narrowing to the apex, opening by pores at the apices which are slightly exserted from the tube of the corolla. *Ovary* with lower portion merged with calyx-tube; style about 5 mm. long, straight; stigma small, capitate. *Fruit* a berry turning red when ripe, sub-globose, about 5 mm. in diam. dry (fresh larger) with the remains of the persistent, shrivelled calyx-lobe bases encircling it near the apex. Fig. 1, A.

Lydenburg: Belvedere, *Keet* 1120. Pilgrims Rest: *Bremekamp* in Tvl. Mus. 28574; Mauchsburg, *Smuts* and *Gillet* 2267; Mt. Anderson, *Pole Evans* 4502; *Smuts* 40; Graskop, *Burtt-Davy* 1481; *Thorncroft* 18315; *Pole Evans* 130; *Galpin* 14483; *Galpin* 14598; btw. Mac Mac and Grasskop, *Loock* s. n.; Marieps Kop Plantation, *Smuts* and *Gillett* 3601; *van Son* 30978; Sabie Hoek Forest, *Burtt-Davy* 1523; Sabie, *Rogers* 20965; Nelspruit: Duivels Kantoor, *Thode* A 1619; *Galpin* 659; Kaapsche Hoop, *Rogers* 18775. Barberton: Havelock Mine Rd., *Acocks* 12858; *Codd* 1608. (Hutchinson records having collected it at Crave Farm, 13 m. West Wylies Poort but specimen not seen.)

Also recorded from Mt. Milanji, Nyasaland.

Type from Duivels Kantoor, Nelspruit District, *Bolus* 7616 in Herb. Kew.

When describing the South African species in 1891, Bolus wrote: "Mr. N. E. Brown of Kew, who looked over some of my plants collected during a journey from Delagoa Bay to the Transvaal Republic, drew my attention to this as a very interesting discovery. No Vaccinium has hitherto been found in S.A., nor indeed any so far south in any part of the world". Three years afterwards when Britten described *V. africanum* from Nyasaland he was evidently not aware of Bolus' find and description, for he writes, "This is, I believe, the first Vaccinium recorded from the African continent". Hutchinson in "A Botanist in Southern Africa", p. 352, writes that he is convinced that the two species are not distinct. An examination of specimens from both areas confirms this opinion. In the Transvaal *V. exul* is found in mountainous country, on ledges and in the marginal flora of the forests. The flowering period is August to October.

2. ERICA.

Linn., in Sp. Pl. ed. 1 : 352 (1753); Phillips in Gen. S.A. Fl. Pl. ed. 2 : 559 (1951).

Perennial shrubs or sub-shrubs, usually much branched with numerous slender ultimate twigs. *Leaves* whorled or sub-whorled, usually 3—6-nate, occasionally opposite or alternate and scattered, the blade often narrow with the margins rolled back, usually to the midrib forming a small solid subulate leaf.* (When the margins are rolled right to the midrib leaving just a line down the centre the leaf is described as sulcate and when not rolled quite so far it is called "open backed".) *Inflorescence* umbellate or flowers 1 to few in the axils of the leaves or clustered at the apices of the branches or the ultimate lateral twigs; pedicels usually 3 bracteate. *Calyx* mostly 4-partite sometimes conspicuous and coloured. *Corolla* gamopetalous, tubular, campanulate or urceolate sometimes inflated, 4-lobed; lobes erect, spreading or recurved. *Stamens* normally 8, filaments free, anthers opening by pores or slits, usually in upper portion of the cell, sometimes spurred or otherwise appendaged. *Ovary* normally 4-celled with 2 to many ovules in each cell; style filiform; stigma simple, capitate, peltate or cyathiform. *Capsule* variously shaped with loculicidal dehiscence. *Seeds* minute.

Key to the Species.

Flowers with the corolla the most conspicuous part:
- Corolla large 1 to 4 cm. long:
  - Corolla about 1 cm. long, puberulous outside with short hairs, sometimes glabrescent; anthers distinctly spurred at the base, spurs curved .. .. .. 1. *E. oatesii*
  - Corolla usually 2—3·5 cm. long (shorter in variety "barbertona" but then pubescence of long and short hairs) hairs up to 1·5 mm. long, and anthers not tailed at the base or sometimes obscurely tailed, tails more or less parallel with the filament .. 2. *E. cerinthoides*
- Corolla less than 1 cm. long:
  - Flowers in dense narrow 1—7 cm. long pseudo spikes .. 3. *E. alopecurus*
  - Flowers not as above:
    - Flowers over 2 mm., mostly 3—5 mm. long:
      - Corolla tubular ± 5 mm. long; branchlets with dendroid hairs, hairs on leaves forked at apex 4. *E. atherstonei*
      - Corolla urceolate or cyathiform, less than 5 mm. long:
        - Flowers in subglobose capitula, sepals pilose with long gland-tipped hairs .. .. .. 5. *E. holtii*

*The characteristic leaves have provided the name "ericoid" for similar leaves in other genera found quite commonly in the "fynbos", maccia, of the Cape.

Flowers 2—6 nate, not in capitula, sepals glabrous or shortly pubescent .. 6. *E. drakensbergensis*

Flowers 2 mm. long or less:

Stigma large peltate or cyathiform; pubescence of simple hairs only:

Flowers red, axillary in upper leaves forming an oblong terminal inflorescense bristling with subulate leaves; leaves narrow not open backed; calyx lobes unequal or some suppressed .. .. 7. *E. alticola*

Flowers white, pink or greeny yellow, terminal, occasionally appearing axillary but not forming oblong inflorescences as above; leaves rounded on margins and at least some open backed:

Calyx united for about half its length, flowers slightly longer than broad with corolla lobes sharply inflexed; shrubs up to 8 ft. tall .. .. 8. *E. natalitia*

Calyx united for less than half its length or divided almost to the base; flowers usually broader than long; shrubs 1—4 ft. tall:

Leaves more or less erect; corolla lobes minutely and sparsely pubescent dorsally .. .. 9a. *E. leucopelta* var. *ephebioides*

Leaves spreading and the majority wide open backed .. .. 9b. *E. leucopelta* var. *luxurians*

Stigma small capitate; pubescence with forked or dendroid hairs scattered among the simple hairs:

Twigs thinly puberulous and with thinly scattered dendroid hairs; flowers terminal on lateral twigs giving appearance of verticillate inflorescence .. .. .. 10. *E. subverticillaris*

Twigs copiously hispidulous, hairs mostly plumose or forked, some gland-tipped; flowers mostly axillary .. .. .. 11. *E. woodii*

Flowers with calyx conspicuous, almost concealing the corolla .. .. 12. *E. caffrorum*

1. **E. oatesii** *Rolfe* in Oates, Matabeleland ed. 2 : 402, t. 11 (1889); Guthrie and Bolus in Fl. Cap. 4, 1 : 87 (1905).

Shrubs 1 to 4 ft. tall; twigs shortly greyish puberulous and usually sparsely hirsute as well in parts, hairs sometimes gland-tipped. *Leaves* 3—4-nate, suberect to spreading or sometimes recurved, margins reflexed, about 8—10 mm. long, 1·5 to 2 mm. broad, or sometimes open backed and up to 3 mm. broad (see variety latifolia), glabrous or puberulous, the upper usually ciliate and sparsely hispid as well, long hairs often gland-tipped. *Flowers* terminal several together; pedicels about 5 mm.

long, often suffused red, puberulous and sometimes also hispid; hairs often gland-tipped; bracts 3, usually 1 remote and 2 just below calyx. *Calyx* segments ovate-lanceolate, usually red, puberulous and sparsely ciliate with long gland-tipped hairs. *Corolla* pink to scarlet shortly puberulous outside (occasionally glabrous) ovoid tubular to tubular and somewhat inflated, about 1 cm. long, narrowed at the mouth; lobes 1—2 mm. long, suberect. *Stamens* 8, included; filaments flattened, long; anthers 1·5 mm. long, spurred; spurs curved, about half as long as the anther or less. pores open in upper half. *Ovary* villous with whitish hairs; style long; stigma capitate, eventually exserted. Fig. 1, B.

Ermelo: nr. Swaziland Border, *Gunn* 1; *Frean*, s.n.; Lake Chrissie, *Moss* 16906; Athole. *Acocks* 11703 and 11702 (form with spreading leaves); Mavieriestad, *Pott* 4916 and 14954; Carolina: *Roberts* 14670; Wakkerstroom, *FitzSimons* 26018 (form with spreading leaves).

Also found in Natal.

The type is said to have been collected "between Pietermaritzburg and the Crocodile Riv." Records indicate it was most probably from the Drakensberg where the route went through the mountains in those days (1873) and might have been near Amajuba.

E. oatesii grows in rocky or mountainous country usually near streams and flowers principally from March to August. The flowers are said to be pink, pinky red or scarlet. The species is closely related to *E. cerinthoides* but has a shorter and more ovoid corolla. From *E. cerinthoides* var. *barbertona* Bolus, which has a short corolla, it differs in the corolla being puberulous to glabrous and not with scattered gland-tipped hairs intermixed. In habit it differs in being 1 to 4 ft. tall whereas var. "*barbertona*" has stems about 6 ins. tall from a thick rhizome. The anthers in *E. oatesii* have distinct curved spurs whereas in *E. cerinthoides* and its variety they are either muticous or obscurely spurred, the spurs being parallel with the filaments.

E. oatesii var. *latifolia* Bolus, Fl. Cap. 4, 1 : 87, is probably just a form in which the leaves are broader through being more open-backed. Some specimens in Nat. Herb. have some broad leaves but not the other characters of the variety. Specimens cited under the variety in the Fl. Cap. are from Natal and Bushmans Riv.

2. **E. cerinthoides** *Linn.* Sp. Pl. ed. 2 : 505 (1764); Bolus and Guthrie in Fl. Cap. 4, 1 : 87 (1905); Esterhuysen in Fl. Pl. of Afr. Vol. 28 pl. 1099 (1951).

Shrubs 6 ins. to 3 ft. high, twigs shortly and densely greyish puberulous,

very occasionally sparsely hirsute as well, the long hairs sometimes gland-tipped (see Blaauwberg specimen and one from Louis Trichardt). *Leaves* 4—6-nate, erect to suberect or spreading, usually 5—8 mm. long, 1 mm. broad, glabrous, the upper often aristate and sometimes sparsely ciliate with long or short hairs, margins reflexed so that leaves are sulcate dorsally or sometimes open backed; petiole about 1 mm. or less long, yellowish, erect, appressed to branch. *Flowers* umbellate; pedicels about 5 mm. long densely puberulous; bracts 3, 2 usually just below the calyx segments and similar to them. *Calyx segments* 4, ovate lanceolate acuminate about 8 mm. long and 3·5 mm. broad, hirsute and ciliate with long gland-tipped hairs, *Corolla* white and crimson or rose coloured, more or less tubular somewhat inflated and constricted at the mouth up to 3·5 cm. long and about 7 mm. diam. at greatest width just above the middle, pubescent with hairs up to 1·5 mm. long and often gland-tipped; lobes about 2 mm. long sub-erect. *Stamens* 8 on long filaments but not exserted; anthers about 2 mm. long, not tailed or with rudimentary tails, pores open in upper half. *Ovary* villous with whitish hairs; style long; stigma capitate eventually exserted. (Fig. 2, A.)

Zoutpansberg: Happy Rest, nr. Louis Trichardt, *Gerstner* 6021. Pietersburg: Blaauwberg, *v. d. Merwe* 1380. Belfast: north of Belfast, *Reynolds* 3702, 4301 and 4302; *Codd* and *de Winter* 3233. Standerton: Volksrust, *Gray* 4168; Lydenburg: Sekukuniland, *Gray* 3314; 8 m. E. of Lydenburg, *Codd* 3284; Steenkampsberg, *Pole Evans* 2020; *v. d. Merwe* s. n.; "Lisbon", *Liebenberg* 3556. Ermelo: *Henrici* 1408; Mavieriestad, *Pott* 4917 and 14953. Pilgrims Rest: Mt. Anderson, *Smuts* and *Gillett* 2387; Mac Mac, *Reynolds* 4029; *Burtt-Davy* 1446; Marieps Kop, *van Dam* in Tvl. Mus. 26301. Carolina: Leeuwpoort, *Burtt-Davy* 7345; *Leviseur* in Tvl. Mus. 35921. Barberton: Louws Creek, *Grenfell* s. n.

Also found in the Western and Eastern Cape Province, O.F.S., Basutoland, Natal and Swaziland.

Type locality is Table Mountain, Western Cape Province.

A very variable species with a wide distribution being from Table Mountain in Western Cape along mountainous country in the east and north and to the Blaauwberg in the north-western Transvaal. It may be found in flower at any time throughout the year.

var. **barbertona** (*Galpin*) *Bolus* in Fl. Cap. 4, 1 : 88 (1909). (= *E. barbertona* Galpin in Kew Bull. 1895, 148.)

The variety is distinguished by the shorter corolla tube. The type specimen, which is a complete plant, also differs in having many slender

stems, only a few inches high, growing from a thick woody rhizome. Bolus in sinking Galpin's species under *E. cerinthoides* expresses the opinion that this habit of growth is probably due to veld fires. Whether this is correct or not the variety is being here upheld, at least for the time being on this combination of characters.

For the characters by which this variety is distinguished from *E. oatesii*, which has the corolla about the same length, see the notes under *E. oatesii*. (Fig. 2, B.)

Barberton: in mountains, *Galpin* 598 (type); *Thorncroft* s. n.; *Keet* 1177; *Williamson* 270.

Also recorded from Nkandhla, Natal.

Type locality is "stony ridges on mountain summit, Barberton".

3. **E. alopecurus** *Harv.* in Thes. Cap. 1 : 31, t. 48 (1859); Guthrie and Bolus in Fl. Cap. 4, 1 : 118 (1905).

Shrub 6 ins. to 2 ft. high, branched near the base with long slender leafy branches bearing many appressed, often minute branchlets or twigs for their whole length, twigs pubescent with long and short hairs, mostly gland-tipped. *Leaves* 3-nate, 1 cm. long and ·5 mm. wide, pubescent with long and short hairs, mostly gland-tipped, glands very minute, pubescence varying in density, margins revolute, open backed showing a tomentose lower surface and prominent mid-rib. *Flowers* 1—3-nate, on short, slender, erect-appressed ultimate twigs giving the appearance of being in dense cylindrical spikes at the ends of the branches; pedicels about 1·5 mm. long, bracts 3 scattered. *Calyx* segments 4, narrowly ovate-lanceolate about 2 mm. long, ciliate with long gland-tipped hairs. *Corolla* pink or pinky-mauve, pubescent or glabrescent ovoid, inflated, 3 mm. long, constricted at the mouth, lobes short, obtuse spreading. *Stamens* 8, included, filaments about 2 mm. long, anthers brown, ·5 mm. long, distinctly tailed, tails light coloured as long or slightly longer than the cells, rough with minute teeth. *Ovary* villose; style 2·5 mm. long, stigma capitate. (Fig. 1, C.)

Zoutpansberg: *Dyke* in Herb. Marloth 5173. Krugersdorp: *Moss* 10456. Potchefstroom: Elandsfontein, *Louw* 1422. Ermelo: Athole, *Codd* and *Muller* 286; Lake Chrissie, *Moss* 16896 and *Michelmore* 78.

Also occurs in eastern and central Cape Province, Basutoland and Natal.

Type locality is either "Caffreland" (*Brownlee* s. n.) or "Rovelo Hills,

Natal" (*Sutherland* s. n.) for specimens from both are cited by Harvey and the lectotype is still to be selected.

An easily distinguished species with its spike-like inflorescence. In Fl. Cap. Bolus describes var. "*glabriflora*" from the Transvaal. Since specimens with glabrous or glabrescent corollas appear in different places, it seems that the pubescence is a variable character rather than that the glabrous specimens should be a distinct variety.

Like several other Erica species it is found in mountainous or rocky country along streams frequently in deep kloofs. The flowering time is usually late summer to early spring, that is about March to October.

4. **E. atherstonei** *Diels* ex *Guthrie and Bolus*, Fl. Cap. 4, 1 : 120 (1905).

Stems procumbent, woody with many slender, erect, leafy, pubescent branchlets, the longer hairs dendroid. *Leaves* erect to slightly spreading, imbricating, about 4 mm. long, ·5 mm. wide, slightly concave on upper surface with a prominent midrib, sulcate and convex below, ciliate and sparsely pubescent, glabrescent, hairs mostly floccose or at least forked at apex. *Flowers* axillary usually crowded at ends of branchlets, pedicels up to 5 mm. long, floccose pubescent, usually cernuous. *Bracts* 3, remote, like leaves but much smaller. *Calyx segments* 4, pink with tips sometimes darker and leaf-like, 3 mm. long, ciliate with a few floccose hairs. *Corolla* mauvy-pink, tubular to somewhat 4-sided, glabrous, 4—5 mm. long, 4-lobed, 4-nerved (which gives the dried flower a 4-cornered shape); lobes 1 mm. long, obtuse, erect. *Stamens* 8, anthers about 2 mm. long sub-exserted, dorsally cristate near base. *Ovary* strigose, 4-celled; style 4 mm. long, exserted; stigma small, capitate. (Fig. 2, C.)

Lydenburg: 17 m. S.E. Lydenburg, *Prosser* 1789. Pilgrims Rest: *Taylor* 1919; Mauchsberg, *Smuts* and *Gillet* 2275 and 2307; Graskop, *Galpin* 14478.

To date known only from Transvaal.

Type locality is "near Lydenburg", *Atherstone* s. n. in Herb. Bolus.

This species is notable for the floccose pubescence, the narrowly tubular corolla which has a prominent nerve or keel down the centre of each of the 4 lobes and runs to the base of the tube giving the corolla a quadrate appearance (at least on the dried specimen).

It is found in mountainous country on peaks or grassy slopes above 4,800 ft. Flowers appear in December to February.

5. **E. holtii** *Schweickerdt* in Kew Bull. 1933, p. 185.

Small *shrub*, about 6—22 cm. tall. *Branches* very slender, reddish brown, puberulous and with longer scattered gland-tipped hairs. *Leaves* 2—4 mm. long, sulcate, minutely puberulous and with sparsely scattered, patent, transparent, gland-tipped hairs, apex usually with a gland-tipped hair. *Flowers* in sub-globose heads, pedicels red, about 1—2·5 mm. long, bracts like the sepals but one usually broader. *Calyx segments* about 3 mm. long, linear acuminate, conspicuously pilose with long, gland-tipped, transparent hairs. *Corolla* white, about 4 mm. long, ovate-urceolate or urceolate, constricted at the mouth, lobes obtuse sometimes spreading. *Stamens* included, anthers aristate, aristae minutely puberulate about as long as the anther cells. *Ovary* densely pubescent; style included, sometimes eventually exserted; stigma small, capitate. (Fig. 3, A.)

Lydenburg: Kemps Heights, about 14 m. S.E. of Lydenburg, *Holt* 226 (type); *du Plessis* in Nat. Herb. No. 28534.

A single specimen from Swaziland and one from Natal may belong to this species. The Swaziland specimen differs in having the flowers longer and more distinctly urceolate and the Natal specimen has practically no long gland-tipped hairs on the stem. Otherwise the species has been recorded only from the type locality.

The type locality is Kemps Heights about 14 miles S.E. of Lydenburg.

The author of the species related *E. holtii* to *E. solandra* distinguishing it by the gland-tipped hairs. In the Flora Capensis *E. solandra* is quoted from the coastal region in the George Division with one record from Van Reenens Pass. This last specimen has since been described as *E. reenensis* Zahlbr. (Ann. K.K. Natur. Hofmus. 22 : 37 (1905). It too can be distinguished from *E. holtii* on the pubescence which is not gland-tipped as may also the rather robust tropical species *E. johnstoniana* Britten.

At the type locality Kemps Heights, near Lydenburg, plants were found recently, where the grass was not able to grow on the hardened ground of an old road. Flowers appeared in March.

6. **E. drakensbergensis** *Guthrie and Bolus* in Fl. Cap. 4, 1 : 166 (1905): Fl. Pl. of Afr. Vol. 30, pl. 1161.

Shrubby much-branched bush 1—4 ft. tall. *Branches* puberulous with short pallid retrorse hairs, rarely a branched hair present. *Leaves* 3—4-nate about 4—5 mm. long, sulcate, usually erect and imbricating,

glabrous or rough with short sparse hairs on the margins. *Flowers* 3—6-nate, terminal on branches and on delicate lateral twigs; pedicels about 2 mm. long, puberulous, usually cernuous, bracts small remote or just below calyx. *Calyx segments* about 1 mm. long, glabrous or obscurely puberulous and ciliate. *Corolla* white, glabrous, about 3 mm. long, cyathiform or sub-urceolate, that is sometimes slightly constricted at the mouth, lobes erect, to slightly spreading and recurved, margins sometimes erosulate. *Stamens* subexserted; anthers spurred at the base. *Ovary* glabrous; style exserted; stigma small sub-capitate crateriform. (Fig. 3,B.)

Zoutpansberg: 4 m. S. of Lake Fundusi, *Galpin* 14908. Pietersburg: Mamatzeei Mt., *Smuts* and *Gillett* 3579; The Downs, *Rogers* 18892. Pretoria: Willow Glen, *Forssman* 3; Donkerhoek, *Repton* 600; nr. Trigaart's Poort, *Dyer* 3194; Witnek nr. Moss Riv., *Pole Evans* 3816. Waterberg: Twenty-four Rivers, *Codd* 959; Sandriviers Poort, *Pole Evans* 19667 H; Nooitgedacht, *Acocks* and *Naude* 64. Witbank: Witbank, *Repton* 1213; Sondagsfontein, *Thode* A 2833; nr. Station, *Gilfillan* in Herb. Galpin 7206. Middelburg: *Schlechter* 4115; Botsebelo, *Marloth* 11757; Pan Station, *Burtt-Davy* 12256; Aasvogelkrans, *v. d. Merwe* 1910; 15 m. W. of Middelburg, *Phillips* in Moss Herb. 1095. Barberton: *Keet* 1174; *Thorncraft* in Tvl. Mus. 4959; *Murphy* in Tvl. Mus. No. 25538. Nelspruit: Brondal, *Verdoorn* 165. Belfast: Waterval Onder, *Rogers* in Tvl. Mus. 2352. Ermelo: Govt. Farm, *Burtt-Davy* 975. Lydenburg: Secocuniland, *Gray* in Govt. Herb. 5935. Pilgrims Rest: Mt. Anderson, *Galpin* 13773; Graskop, *Liebenberg* 2978; *Galpin* 14302; Rosehaugh, *Rogers* in Tvl. Mus. 20373; *Smuts* 87; Black Hill, *Galpin* 14338.

Also recorded from the Eastern Cape, Natal, O.F.S., Basutoland, Swaziland and Transvaal.

Type locality: Sheba Mtn. near Barberton. (Lectotype *Bolus* 7677. Selected by Miss Esterhuysen of the Bolus Herb. because it is the first specimen listed and is exactly localised.)

The colour of the flower, where noted, is white, but some herbarium specimens give the impression that they were coloured, probably pale mauve or pink. The species grows on rocky slopes or the summits of koppies or mountains. The flowers may appear at any time but are more profuse from January to July.

7. **E. alticola** *Guthrie and Bolus* in Fl. Cap. 4, 1 : 217 (1905).

Dwarf shrub, branchlets slender with prominent leaf scars, puberulous when young. *Leaves* 4-nate, sometimes 3-nate, spreading (but petiole

erect and about 1 mm. long) glabrous or very minutely puberulous, some hairs gland-tipped, about 5 mm. long, usually overtopping the flowers, slender, more or less flat above, rounded and sulcate but not open-backed below. *Flowers* reddish in the axils of the leaves in the upper half of the ultimate branchlets forming oblong terminal inflorescences usually bristling with leaves; pedicels 2 mm. long, puberulous; bracts very variable, 1 remote or all approximate, small or large and leaflike, sometimes aborted. *Calyx* segments unequal, sometimes some aborted, one usually large, up to about ·75 mm. long, minutely ciliate, usually keeled *Corolla* cyathiform or very slightly constricted at the throat about 1·75 mm. long, lobes short, about $\frac{1}{4}$ the length of the tube erect, obtuse. *Stamens* 8, filaments ·5 mm. long, cells slightly longer, not tailed at the base, pores in upper half. *Ovary* glabrous, enlarging to the size of the corolla before opening; style ·5 mm. long; stigma large, peltate, 1 mm. diam. or over, sub-included or eventually exserted. (Fig. 5, A.)

Nelspruit: Duivels Kantoor, *Thode* A1620. Barberton: Kaapsche Hoop, *Thorncroft* 2122.

To date only one typical specimen has been found outside the Barberton district. It is from the Drakensberg in Cleft Peak area. Some specimens collected in the Weenen district and elsewhere might prove to be a form or variety of this species.

Type locality, Duivels Kantoor, Barberton, *Bolus* 7678 in Herb. Bolus.

The unequal calyx approaches that of Philippia species, one segment being larger than the others but this segment does not overlap those on each side as in the case of the Philippia. Another *key* character by which the Erica can be distinguished from the Philippia is the presence of bracts but in general appearance they are so very distinct that they could never be confused.

Among the Ericas this species is characterized by the bottle-brush-like inflorescences.

8. **E. natalitia** *Bolus* in Journ. Linn. Soc. Bot. 24 : 187 (1888); Guthrie and Bolus in Fl. Cap. 4, 1 : 307 (1905).

Shrubs up to 8 ft. tall, ultimate branchlets very slender, white puberulous with matted and spreading pubescence, hairs simple, acute, unequal in length. *Leaves* 3-nate sparsely minutely pubescence, erect to spreading, about 3—4 mm. long and almost 1 mm. broad, upper surface subflattened rounded on the edges, deeply sulcate to slightly open backed.

Flowers clustered at the apices of the branchlets occasionally a few in the axils of the upper leaves, white or pink, small, about 1·5 mm. long, often less. *Pedicel* puberulous, ± 1·5 mm. long. *Bracts* usually 3 about midway on pedicel. *Calyx* united to about midway, 4—5 lobed, pubescent; lobes deltoid, conspicuously ciliate. *Corolla* slightly longer than broad, united for more than half its length; lobes broadly rounded, the apical portion inflexed ("connivert" fide Bolus). *Anthers* muticous. *Ovary* thinly pubescent, stigma peltate sub-exserted to exserted. (Fig. 5, B.)

Belfast: near Crocodile River Falls near Dullstroom, *Galpin* 25294.

Also in Natal.

Type locality Indivedive, Natal, *Wood* 990. This species seems very near to some forms of *Erica leucopelta* and is distinguished by being a taller shrub up to 8 ft. and by the calyx being united for about half its length. When both species are better known in the wild state there may be other characters by which to distinguish them.

9a. **E. leucopelta** *Tausch.* var. **ephebioides** *Bolus* in Fl. Cap. 4, 1 : 221 (1905).

Shrub 1—4 ft. with many rather compact ultimate branchlets. *Branchlets* white puberulous to tomentulose with matted and spreading acute unbranched hairs of different lengths. *Leaves* 3-nate, pubescent with spreading acute hairs and a few minute gland-tipped hairs to glabrescent, erect to sub-spreading, 1·5—3·5 mm. long, ·5—·75 mm. broad, rounded to faintly ridged on the margins, sulcate to sub-open-backed dorsally; petiole erect, about ·5 mm. long. *Flowers* terminal on the branchlets and on abbreviated axillary shoots in upper leaves; pedicels thinly pubescent, 1·5—2·5 mm. long; bracts 3, sometimes 1 or 2 only, 2 usually very small, one larger, up to ·75 mm. long, situated about midway on pedicel or scattered. *Calyx* 4-lobed rarely unequally 5—6 lobed, united at the base or for up to a third of its length, thinly pubescent dorsally and ciliate with rather long acute hairs of different lengths. *Corolla* white, about 1·75 mm. long, campanulate, lobes erect, about a third the length of the tube sometimes with a few short hairs on the backs. *Stamens* sub-included; filaments slightly longer than the anthers; anthers brown, muticous, about ·5—·75 mm. long. *Ovary* depressed, broader than long, sometimes thinly hispid on top, shallowly 4—8-lobed; style about 1 mm. long; stigma exserted, large, peltate, about ·75 mm. diam. (Fig. 4, A.)

Pietersberg: Blaauwberg, *Esterhuysen* 21478.

Also occurs in the eastern Cape.

Type locality of this variety is "Mountains near Grahamstown", lectotype *Zeyher* 882 in Bolus Herbarium.

The specimens seen belonging to this variety differ from the typical species not only in the hispid pubescence on the backs of the corolla-lobes, which is often very sparse and on some flowers even absent, but in the flowers being white to pink not greeny yellow, and in the absence of the scattered, very long gland-tipped hairs.

A remarkable feature is the calyx which is joined at the base from shortly so to about a third of its length. In the united calyx it approaches *E. natalitia* which has the calyx united for half its length but the latter is a shrub up to 8 ft. tall and usually has more flowers clustered at the apices of the branchlets; the flowers of *E. natalitia* are also slightly longer than broad and usually have the upper half of the corolla-lobes more abruptly inflexed in the bud stage.

9b. **E. leucopelta** *Tausch* var. **luxurians** *Verdoorn*, var. nov. ramulis laxioribus, foliis longioribus patentibus distinguitur.

Shrub with ultimate branchlets rather lax and spreading. *Branchlets* white puberulous to tomentulose with matted and spreading acute, unbranched hairs of different lengths. *Leaves* 3-nate, glabrous or sparsely pubescent with patent acute hairs and occasionally with a few minute gland-tipped hairs, spreading to sub-erect, 3—6 mm. long and up to about 1 mm. broad, more or less flat on the face, rounded on the margins and dorsally sulcate to open backed. *Flowers* terminal on the branchlets and occasionally on abbreviated twigs in the axils of the upper leaves; pedicels 2—3·5 mm. long, puberulous, glabrescent; bracts usually 3, about midway on pedicel or scattered, mostly ciliate. *Calyx* 4-lobed almost to the base, lobes ciliate. *Corolla* "pink" (fide Thorncroft), about 1·5 mm. long and 2 mm. broad or broader, 4-lobed; lobes short and broad. *Stamens* sub-included; filaments almost as long as the anthers; anthers muticous almost 1 mm. long. *Ovary* depressed globose glabrous or with a few hairs on top, shallowly 4-lobed; style short and thick ultimately 1 mm. long; stigma large, peltate, about ·75 mm. diam., ultimately exserted. (Fig. 4, B.)

Barberton: Ivy Range, *Thorncroft* 551 in Herb. Medley Wood No. 9721 in Herb. Bolus (typus). Pietersburg: Woodbush *Edwards* in Bolus Herb. No. 25293.

The two specimens cited, one from Barberton District and one from the Pietersburg district are the only ones known so far. On the type sheet, Thorncroft 551 in Medley Wood Herb. 9721, Dr. H. Bolus wrote "This was received Febr. 27, 1905 and too late to be included in the ms.

for the Flora Capensis". He then gives his reasons for regarding it as a variety of *E. leucopelta* and gives it the name adopted here, *E. leucopelta* var. *luxurians*, but this was never published.

The variety is easily distinguished from typical *E. leucopelta* and its other varieties in the laxer branching and the longer, more spreading and open backed leaves. The character of the short and broad flowers is accentuated in this variety (see key).

10. **E. subverticillaris** *Diels* ex *Guthrie and Bolus* in Fl. Cap. 4, 1 : 224 (1905).

Dwarf *shrub*, slender branchlets, puberulous with retrorse pubescence and with scattered dendroid hairs. *Leaves* erect or spreading about 2·5 mm. mostly terete, sulcate, some rather flattened and obscure and sparsely ciliate with minute gland-tipped hairs. *Flowers* clustered in axils of leaves on very short lateral branches with rather long internodes between giving the appearance of a verticillate arrangement; pedicels up to 2 mm. long; bracts 1, foliaceous, about midway on pedicel, 2 minute or suppressed. *Calyx segments* sub-foliaceous about 1 mm. long, subterete and tapering to the apex, sometimes sparsely ciliate with usually gland-tipped hairs. *Corolla* cyathiform, about 1·5 mm. long, united for more than half its length. *Stamens* subexserted; filaments rather long, 1 mm. long; anthers small, aristate, tails as long or slightly longer than the anthers. *Stigma* exserted, small, capitellate. (Fig. 5, C.)

Pilgrims Rest: mountains near Lydenburg, *Wilms* 903 in Bolus Herb. (lectotype); between Mauchsberg and Sabie Falls, *Burtt-Davy* 486.

Not recorded outside the Transvaal to date.

Type locality, mountains near Lydenburg, *Wilms* 903, lectotype. (Selected by Miss Esterhuysen of the Bolus Herbarium since it is the specimen Diels named *E. subverticillaris* but never actually published.)

This species is known only from the rather poor specimens cited. The dendroid pubescence and the verticillate appearance of the inflorescence, if constant, would be the characters by which to distinguish it.

var. *β.* **revoluta** *Bolus* l. c. "older leaves on the main branches lanceolate, acute, more loosely revolute, shortly hispid, shining, 2 in. or less long; anthers tapering to the base; awns not more than $\frac{1}{4}$ the length of the cell."—Fide Bolus, no specimen in Nat. Herb.

Type locality, Spitskop near Lydenburg, *Wilms* 908.

11. **E. woodii** *Bolus* in Journ. Bot. Lond. 32 : 237 (1894); Guthrie and Bolus in Fl. Cap. 4, 1 : 214 (1905); Fl. Pl. of Afr. Vol. 27, Plate 1071.

Shrublet up to 2 ft. tall. *Branches* diffuse; branchlets erect, hispidulous with hairs simple or branched, many gland-tipped or forked at the apex, on the same plant. *Leaves* about 2·5 mm. long, more or less ovate-lanceolate in shape, usually rather open-backed and in some forms broad and open-backed, laxly hispid with hairs simple some of which are gland-tipped and some bi- or tri-fid at the apex (flowers overtopping the subtending leaves); petiole minute. *Flowers* pink or red, axillary on short lateral branchlets; pedicels about 2 mm. long; bracts small often wanting or caducous, 2 approximate one remote (about midway). *Calyx* segments not like the leaves but thin and coloured, about 1 mm. long, ciliate with long hairs, acute. *Corolla* sub-campanulate sometimes slightly narrowed at the throat, about 1·75 mm. long, lobes rounded with an acute apex, erect or slightly spreading. *Stamens* included; filaments about 1·5 mm. long, anthers aristate, tails as long or shorter than the anther. *Stigma* exserted, capitate. (Fig. 3, C.)

Zoutpansberg: Entabini Forest Reserve, *Codd* 4191 (broad-leafed form); Sibasa, *Rodin* 4097 (broad leafed). Pietersburg: Houtboschberg, *Schlechter* 4749; *Obermeyer* 31969 in Tvl. Mus. (broad-leafed form); The Downs, *Crundall* s. n.; New Agatha, *McCallum* s. n.; Blaauwberg, *Leeman* 114. Rustenburg: Baviaanskloof, *Brown* in Nat. Herb. 28372. Pretoria: Hekpoort, *Esterhuysen* 15566. Waterberg: Warmbaths, *Leipoldt* s. n. Belfast: *v. d. Merwe* 1270; Crocodile Riv. Falls, *Galpin* 13301; Suikerbos Kop, *Galpin* 12457; Dullstroom, *Taylor* 1930; Elandskop nr. Dullstroom, *Galpin* 13347. Barberton: *Edwards* 3; *Liebenberg* 2414; *Thorncroft* 4962 in Tvl. Mus.; Saddleback Mtn., *Galpin* 817; Lomati Valley, *Thorncroft* 2097 (galled specimen); Barberton Mts., *Burtt-Davy* 345. Lydenburg: *Keet* 1121; Sterk Hill, *Burtt-Davy* 468. Pilgrims Rest: Mauchsberg and Sabie Falls, *Burtt-Davy* 488; Pilgrims Hill, *Galpin* 14493; Mt. Anderson, *Galpin* 13774 and 13775; *Pole Evans* 3996; *Rogers* 20293 in Tvl. Mus. (very broad-leafed form); Little Mac Mac Falls, *Galpin* 14518; Pilgrims Rest, *Taylor* 1901; Sabie *Codd* 6432; Kowyns Pass, *Acocks* 12890 (broad leafed form); *Codd* 1657 (broad-leafed form); *Liebenberg* 2975 (broad leafed form).

Also found in Swaziland, Natal and the eastern Cape Province. (N.B.: There is a record from the Cedarberg, Marloth 2685. The specimen in the Nat. Herb. under this number is *E. woodii* but the locality on the label may be a mistake.)

Type locality, Little Noods Berg, Natal, *Wood* 4136.

A widely spread species characterized by its mixed pubescence, short and long hairs, simple, gland-tipped or bi- to trifurcate at the apex all

usually on the same plant. Several specimens, especially from Kowyns Pass and Sibasa, have broad open-backed leaves. While these may constitute a distinct form yet, without supporting characters to distinguish it, it can hardly be described as a distinct variety. The variation in the leaf is therefore included in the general description of the species at least for the time being.

It is usually found in ravines and on mountains. The most usual flowering time is January to July.

12. **E. caffrorum** *Bolus* in Journ. Linn. Soc. Bot. 24 : 184 (1888); *Guthrie* and *Bolus* in Fl. Cap. 4, 1 : 251 (1905).

A much branched shrublet sometimes up to 6 or 10 ft. tall. *Branchlets* puberulous to tomentulose. *Leaves* 4-nate, crowded, imbricating, often appressed to branchlets but sometimes erect spreading, about 5 mm. long including the 1 mm. long petiole, glabrous or occasionally puberulous to tomentulose, at least at the base within, usually ciliate, inner surface flat, outer rounded and sulcate. *Flowers* white to pink, about 3—4 mm. long, pedicels puberulous-tomentulose; bracts like the calyx lobes but smaller under 2 mm. long and 1 mm. broad, fimbriate on the margins, rounded dorsally with an obscure sulcate midrib in upper half concave on inner face to form a trough. *Calyx lobes* about 3 mm. long and 1·5 mm. broad usually two-thirds the length of the corolla (2 segments with callous at base within), fimbriate on the margins, dorsally rounded and with a sulcate keel in upper half, inner face concave. *Corolla* up to 4 mm. long, tube 2·5 mm. long, cyathiform, lobes erect, about 1·5 mm. long, obtuse. *Stamens* included, filaments about 2 mm. long, anthers just under 1·5 mm. long, shortly spurred dorsally, spur oppressed to lower third of cell. *Style* exserted about 2·5 mm. long, capitellate. (Fig. 6, A.)

Potgietersrust: Farm Portugal, *Maguire* s. n. Pilgrims Rest: Mt. Anderson, *Pole Evans* 3999; *Smuts* and *Gillett* 2384. Belfast: Dullstroom, Suikerboskop, *Galpin* 13133 and 13090. Lydenburg: Steenkampsberg *Codd* 8212.

Also recorded from Eastern Cape Province, Basutoland and Natal.

Type locality, Bazeja, Kaffraria, *Baur* 507, lectotype. (Selected by Miss Esterhuysen of the Bolus Herbarium because it is cited first in the original description and because the material is ample.)

In Fl. Cap. Guthrie and Bolus describe three varieties. With the material in the National Herbarium it has not been possible to distinguish these varieties and so no attempt was made to identify the Transvaal specimens accordingly. The specimens however appear quite homo-

geneous and so would go into one of the varieties, that most likely being *E. caffrorum* var. *luxurians*.

The species is found in mountainous country on grassy slopes, edges of forest, cliffs or mountain tops. Flowering from August to April.

3. PHILIPPIA

Klotzsch in Linnaea, 9: 354 (1834); Phillips in Gen. S.A. Fl. Pl. ed. 1: 460 (1926).

(Not in Ed. 2 where it is sunk under Blaeria, p. 560.)

Shrubs or small trees about 2—15 ft. tall, much branched, ultimate twigs slender and erect. *Leaves* ericoid. *Flowers* small, clustered at or towards the apices of the slender ultimate twigs. *Calyx* 3—4-lobed or partite one lobe usually bigger than the rest and overlapping the lobe on each side of it. *Corolla* 3—4-lobed, lobes erect or incurved at the apex. *Stamens* 8 (sometimes 6 on same plant), anthers without spurs. *Ovary* 4-celled; style peltate exserted.

The decision to retain the genus *Philippia* instead of following Phillips [see Journ. of S.A. Bot. 10 : 69–73 (1944) and Gen. of S.A. Fl. Pl. ed. 2 : 560 (1951)] who sinks it and three other genera under *Blaeria*, was arrived at for the following reasons: (1) the elements in the family Ericaceae in Southern Africa are very numerous and closely related and while it is difficult to separate the genera because of borderline species yet it is possible to place the majority of species in the existing genera —lumping some of these genera does not help much for there are still borderline species that would call for further lumping; (2) the species in question, with one calyx lobe longer than the others and outside them, conforms exactly to the definition of the genus Philippia; and (3) the botanists in the Cape are retaining the genus [see Salter in Fl. of the Cape Peninsula, page 627 (1950)] and in all the work on the Ericaceae so far done in tropical Africa this genus is also maintained even in the recent "Adumbratio Florae Aethiopicae 2, Ericaceae (1953)".

Philippia simii S. Moore in Journ. Linn. Soc. Bot. 40 : 129 (1911).

Shrub 2—5 ft. high, much branched. *Twigs* erect or sub-erect, leafy, the young ones grey tomentulose-puberulous. *Leaves* erect or sub-erect, 3-nate about 2·5—5 mm. long (petiole ·5 mm. long), flat above and rounded and sulcate below, glabrous and shiny with margins ciliate-dentate. *Pedicels* without bracts or scars, glabrous 1·25 mm. long. *Calyx* 4-partite one lobe a little larger than the others (sometimes becoming much longer) and overlapping them on both sides (i.e. exterior), lobes ciliate about 1·5—2·5 mm. long, keeled towards apex. *Corolla* (pale

green fide Esterhuysen) about 2 mm. long, tube campanulate, lobes about 1 mm. long, obtuse and obscurely serrate, inflexed over the anthers. *Stamens* 8, sometimes 6; included; filaments about ·5 mm. long; anthers about 1 mm. long, unappendaged, cells opening by pores in upper two-thirds. *Ovary* 4-celled, pale yellowish, glabrous, under 1 mm. diam.; style up to 1·5 mm. long; stigma peltate (red fide Esterhuysen), long exserted. (Fig. 6, B.)

Zoutpansberg: Entabeni, *Taylor* 749; *Obermeyer* in Tvl. Mus. 30046; Lake Fundusi, *Galpin* 14913; nr. Louis Trichardt, *Compton* 18072. Pietersburg: Blaauwberg, *Leeman* 66: *Esterhuysen* 21477.

Also recorded from S. Rhodesia and P.E.A.

Type locality will depend on the lectotype selected, either *Swynnerton* 612 from Melsetter or *Sim* 5688 from Bajon Magenza da Costa, P.E.A.

The selection of a lectotype for this species is being left in abeyance since the two specimens quoted by S. Moore, when describing the species, come from very different habitats, the Swynnerton specimen being from the mountainous country of Melsetter "common tree on wind-swept slopes of the higher hills overlooking Melsetter", while Sim's specimen (from which the specific name is taken) comes from the wet sandy flats near Bajon Magenza da Costa. Specimens from these localities differ very slightly from each other and it is therefore possible that they may in time be considered to be distinct. In that case the question arises should the name *P. simii* be applied to the Swynnerton specimen or the Sim specimen. This decision should be left to the botanists working on "Flora Zambesiaca", especially since there is also some doubt as to whether *P. pallidiflora* Engl. (an earlier name) is distinct. In the meantime, in spite of the slight differences in the two forms, the specimens from the mountains and those in the sandy flats, are being considered conspecific and are identified as *P. simii* S. Moore.

The specimens from the Transvaal, which occur on rocky slopes in the mountains, differ slightly from both forms, the flowers being rather bigger (2 mm. instead of 1·5 mm.) and the leaves more persistent. In most other respects they agree with the species which is characterized by the flowers being clustered at the apices of the slender virgate twigs, with the peltate stigmas well exserted and the corolla lobes inflexed over the anthers.

The Transvaal specimens are described as shrubs 3—5 ft. high and those from further north as shrubs or small trees from 1·5—5 m. high. The Transvaal specimens which seem to retain their leaves rather longer than the others usually dry a rather dark colour.

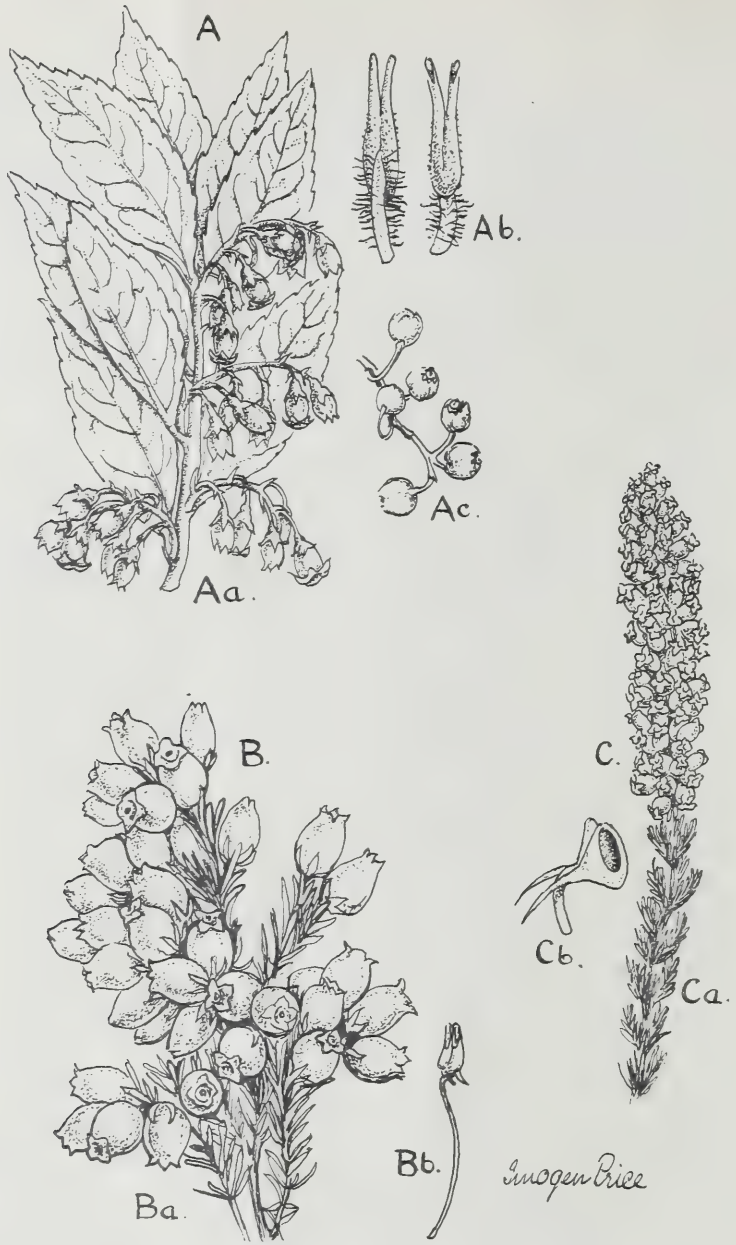

Fig. 1. A. *Vaccinium exul* Bolus: Aa, branchlet, nat. size, after M.S. in Hook Ic. Pl. 1941; Ab, stamens × 12; Ac, twig with fruits from dried specimen in N.H. nat. size.

B. *Erica oatesii* Rolfe: Ba, top of branchlet nat. size, after Fitch in Oates, Matabeleland, ed. 2, t. 11; Bb, stamen × 6.

C. *Erica alopecurus* Harv.: Ca, top of branch, nat. size, after Harvey in Thes. Cap. 1, 31, t. 48; Cb, stamen and part of filament × 20.

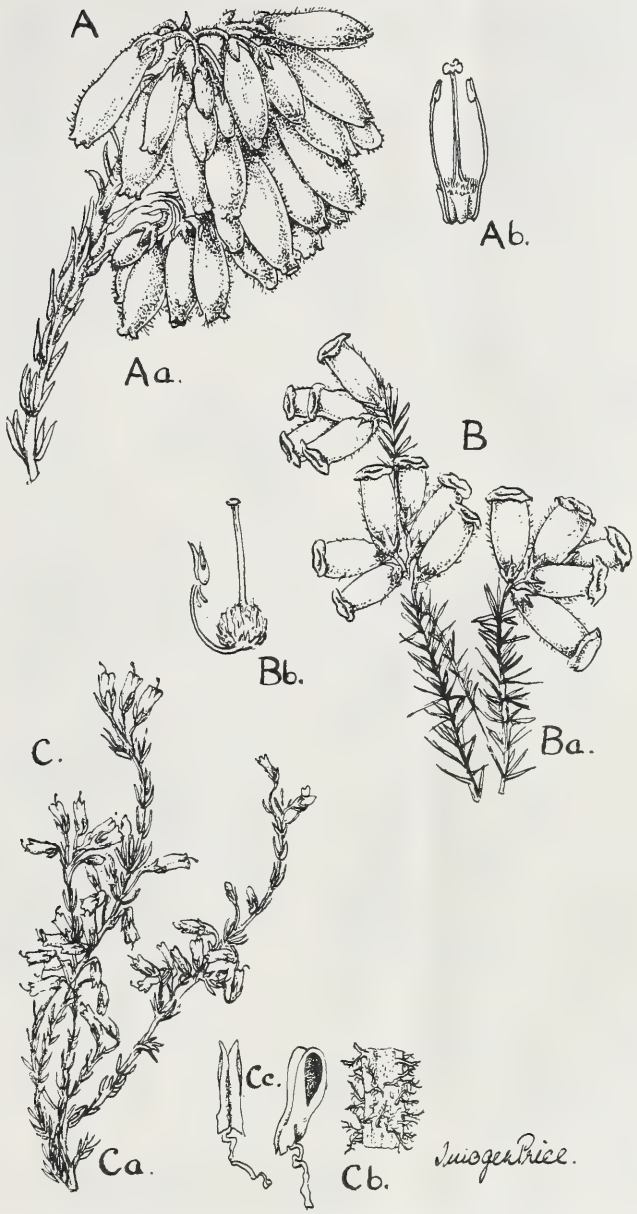

Fig. 2. A. *Erica cerinthoides* L.: Aa, top of branchlet, nat. size, after C. Letty in Fl. Pl. of Afr. Pl. 1099; Ab, gynoecium and 2 stamens × 1½.
B. *Erica cerinthoides* var. *barbertona* Bolus: Ba, top of branchlet, nat. size, after de Jongh (unpublished in N.H.); Bb, gynoecium and stamen × 2.
C. *Erica atherstonei* Guthrie & Bolus: Ca, branchlet, nat. size, from dried specimen, Smuts and Gillett 2275; Cb, portion of twig showing dendroid hairs × 8; Cc, stamens × 8

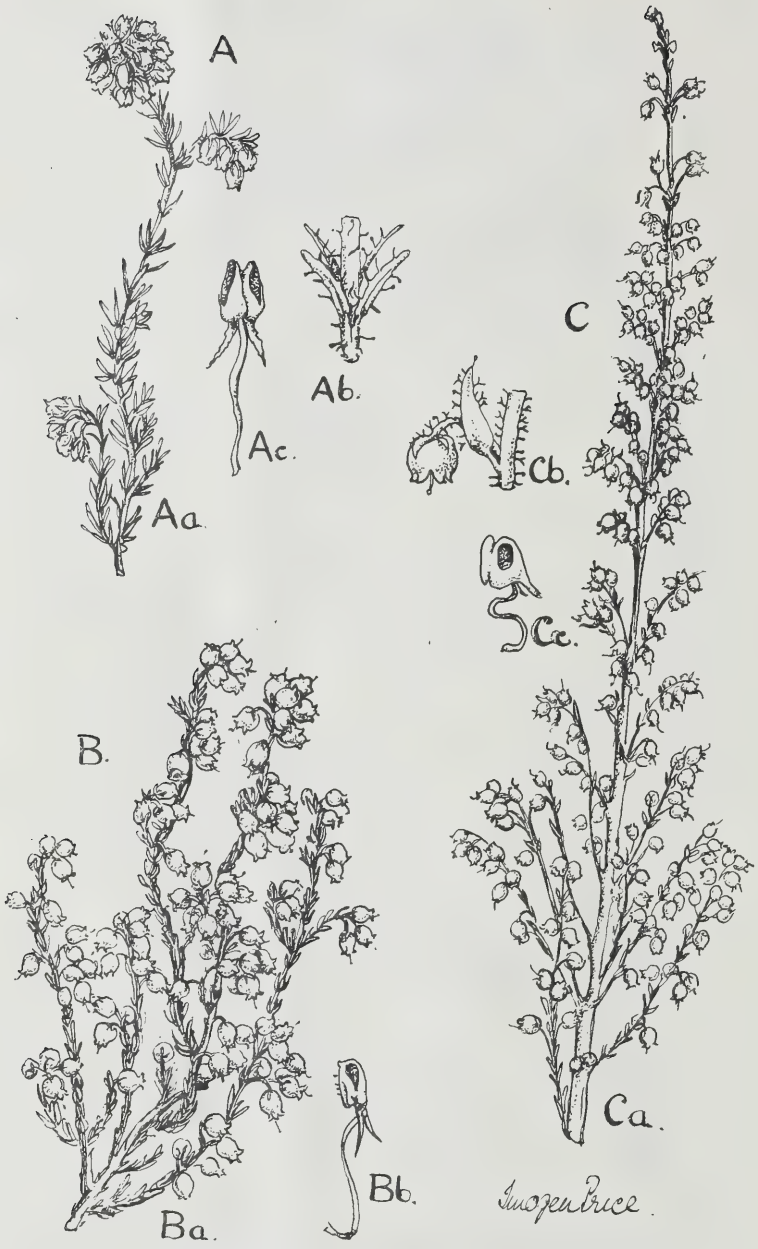

FIG. 3. A. *Erica holtii* Schweickerdt: Aa, branchlet, nat. size, from dried specimen, Holt 226 (type); Ab, portion of twig with leaves × 3; Ac, stamen × 8.
B. *Erica drakensbergensis* Guthrie & Bolus: Ba, branchlet nat. size, after C. Letty in Fl. Pl. of Afr. pl. 1161; Bb, stamen × 8.
C. *Erica woodii* Bolus: Ca, branchlet, nat. size, after R. Brown in Fl. Pl. of Afr. pl. 1071; Cb, portion of twig with leaf and flower × 4; Cc, stamen × 8.

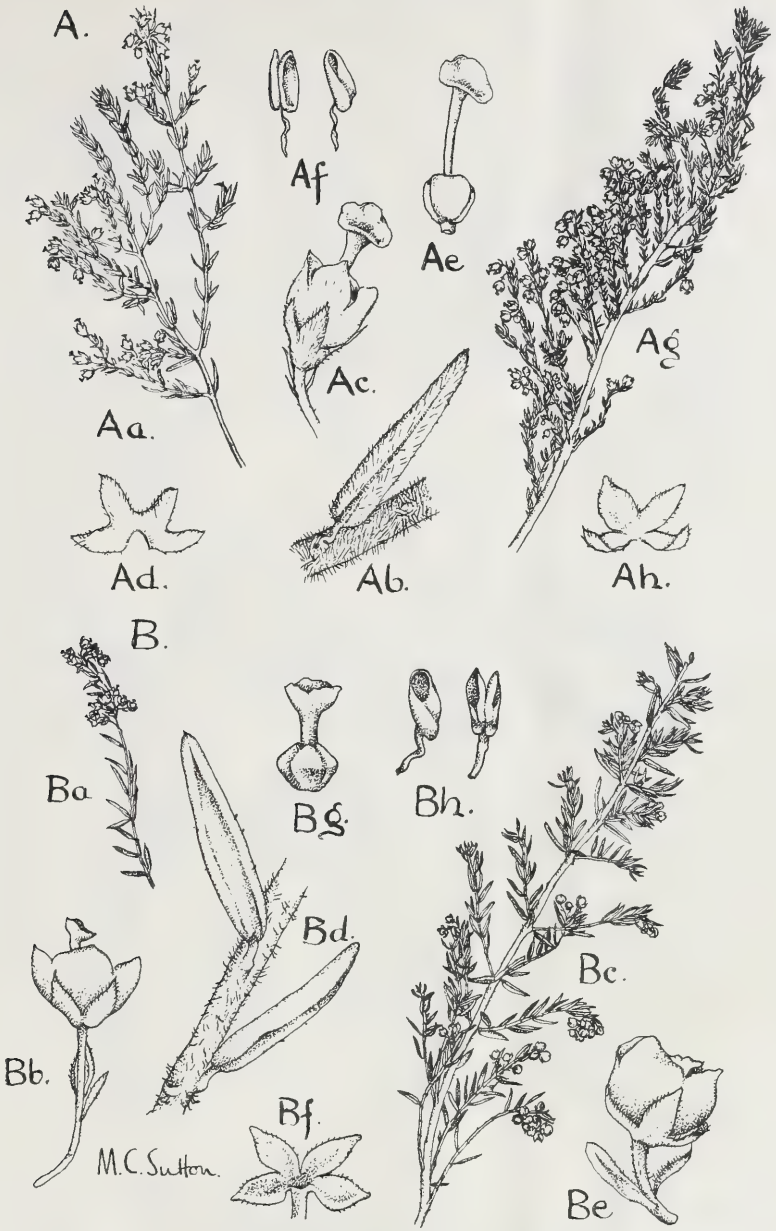

Fig. 4. A. *Erica leucopelta* var. *ephebioides* Bolus: Aa, branchlet, nat. size, from dried specimen Esterhuysen 21478; Ab, portion of twig and leaf × 10; Ac, flower, pedicel and bracts × 8; Ad, calyx joined for a third its length × 8; Ae, stigma, style and ovary × 8; Af, stamens × 12; Ag, branchlet, nat. size, from same gathering Esterhuysen 21478 with more glabrous leaves and calyx divided almost to base; Ah, calyx of g × 8.

B, *Erica leucopelta* var. *luxurians* Verdoorn: Ba, branchlet nat. size from dried specimen Thorncroft 551 (type); Bb, flower, pedicel and bracts × 8; Bc, branchlet nat. size from dried specimen Edwards 25293 with shorter pedicels and style; Bd, portion of twig and leaves of c × 5; Be, flower, pedicel and bracts of c × 10; Bf, calyx of c × 10; Bg, stigma, style and ovary of c × 10; Bh, stamens × 14.

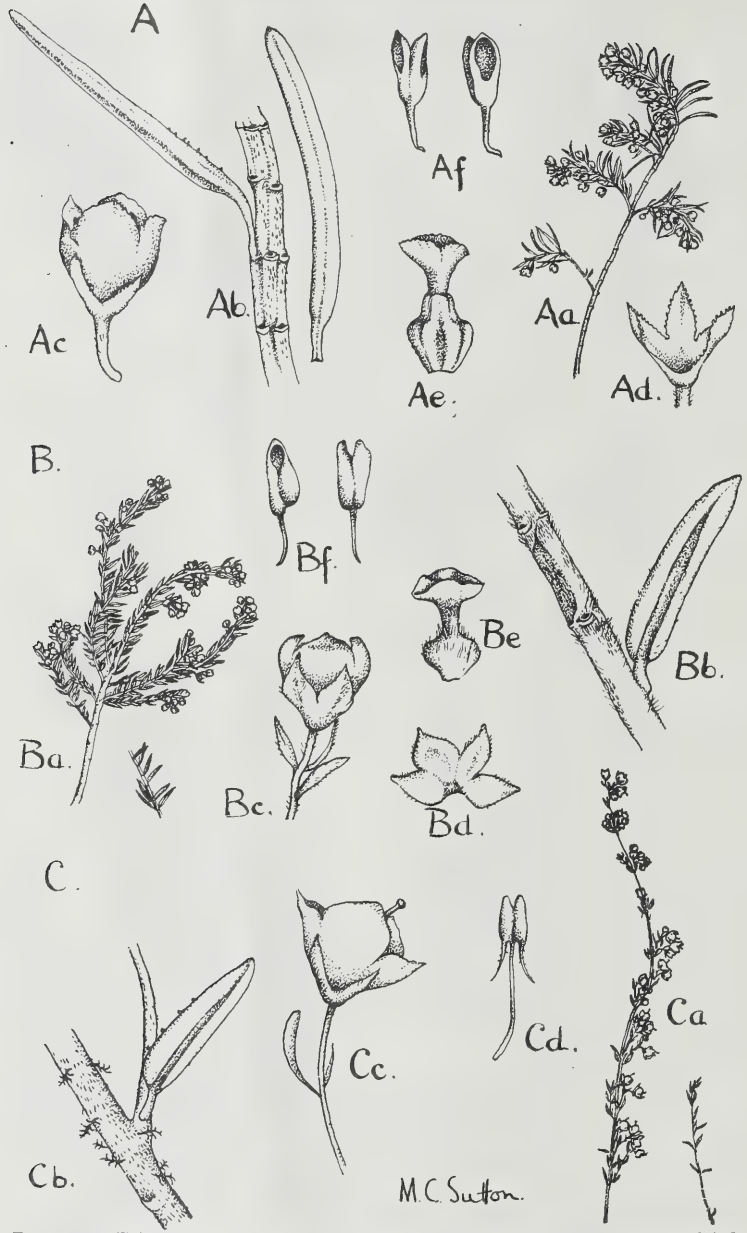

FIG. 5. A. *Erica alticola* Guthrie & Bolus: Aa, branchlet nat. size, from dried specimen Thorncroft 2122; Ab, portion of twig and leaves × 8; Ac, flower and pedicel × 8; Ad, calyx × 10; Ae, stigma, style and ovary × 20; Af, stamens × 20.

B. *Erica natalitia* Bolus: Ba, branchlet nat. size, from dried specimen Galpin 25294; Bb, portion of twig and leaf × 8; Bc, flower, pedicel and bracts × 8; Bd, calyx × 8; Be, stigma, style and ovary × 10; Bf, stamen × 20.

C. *Erica subverticillaris* Guthrie & Bolus: Ca, branchlet nat. size from dried specimen Wilms 903 in Herb. Bolus; Cb, portion of twig and leaf × 10; Cc, flower, pedicel and bracts × 10; Cd, stamen × 20.

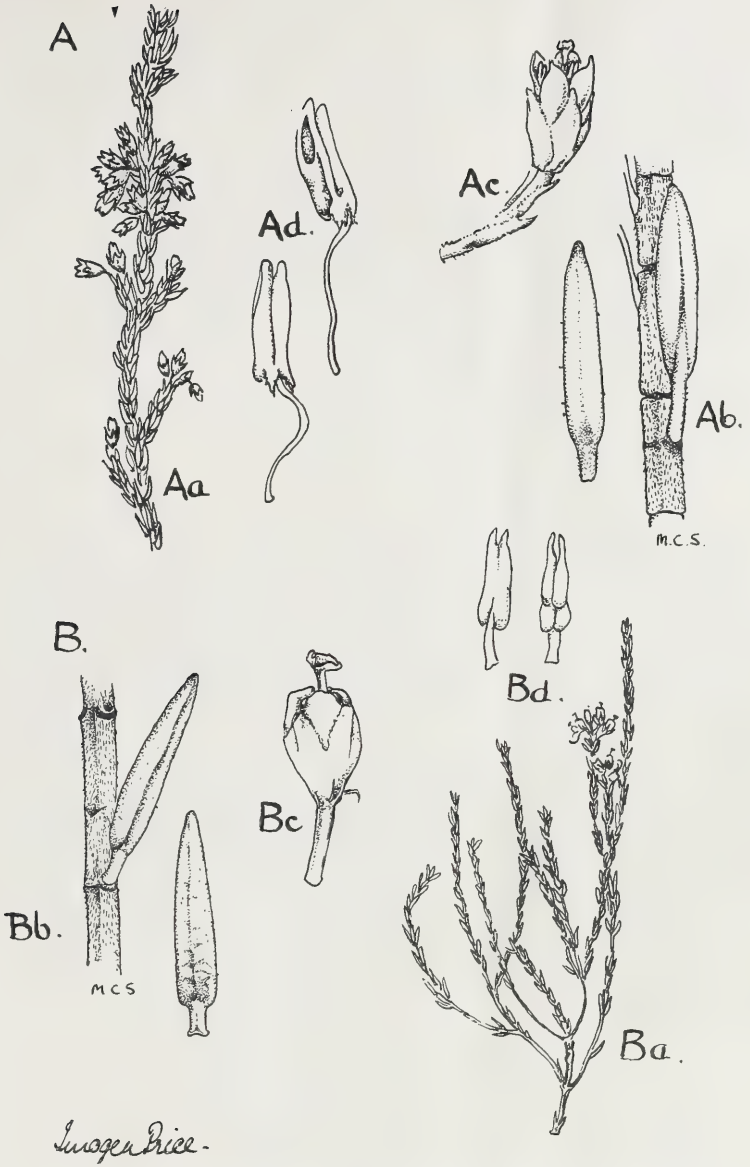

Fig. 6. A. *Erica caffrorum* Bolus: Aa, branchlet nat. size from dried specimen Galpin 13090; Ab, portion of twig and leaves × 6; Ac, flower, pedicel and bracts × 5; Ad, stamens × 20.
B. *Philippia simii* S. Moore: Ba, branchlet nat. size from dried specimen Galpin 14913; Bb, portion of twig and leaves × 6; Bc, flower and pedicel × 10; Bd, stamen × 15.

SOME OBSERVATIONS ON *GIGARTINA PISTILLATA* (GMEL.) STACKH. FROM PORT ALFRED WITH A RECORD OF PLANTS BEARING BOTH TETRASPORES AND CARPOSPORES.

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(With Plate VII.)

Most Florideae show an alternation of diploid and haploid individuals, the former bearing tetraspores and the latter bearing the male and female reproductive organs, usually on distinct individuals. Species with an alternation of tetrasporic and sexual individuals sometimes show deviations from the normal pattern in that tetrasporangia and sexual organs occur on the same individual. Such abnormalities have been recorded for about seventy species (Drew, 1951). They are prominent among the Ceramiales and especially among the Ceramiaceae (Fritsch, 1945; Drew, 1951).

The general morphology of tetrasporic and sexual individuals is the same in most of those species of Florideae where an alternation of tetrasporic and sexual individuals is found. There are, however, some exceptions. The best known South African example is afforded by *Gigartina stiriata* (Turn.) Aresch, the tetrasporic plant of which has such a distinctive appearance that it was at one time thought to be a distinct species, *G. burmanii* (Mert.) J. Ag. A further example is presented by *G. pistillata*. The tetrasporic plant of *G. pistillata* shows profuse dichotomous branching in one plane, the axes being more or less terete. The tetrasporangia are sunk in the tissues of the thallus and occur in somewhat distorted small marginal areas along the sides of the more distal branches. The tetrasporangial areas are irregularly scattered and to a greater or lesser extent they may run into one another (Fig. 1). Only limited material of the male plant has been obtained but it seems to have much the same appearance as the tetrasporophyte. The carposporic plant differs from the tetrasporophyte in having numerous simple or branched ramuli arising at right angles to the dichotomous branches which bear them (Fig. 2). A greater or lesser number of these ramuli bear one or more sessile cystocarps although cystocarps borne in a terminal position may appear to

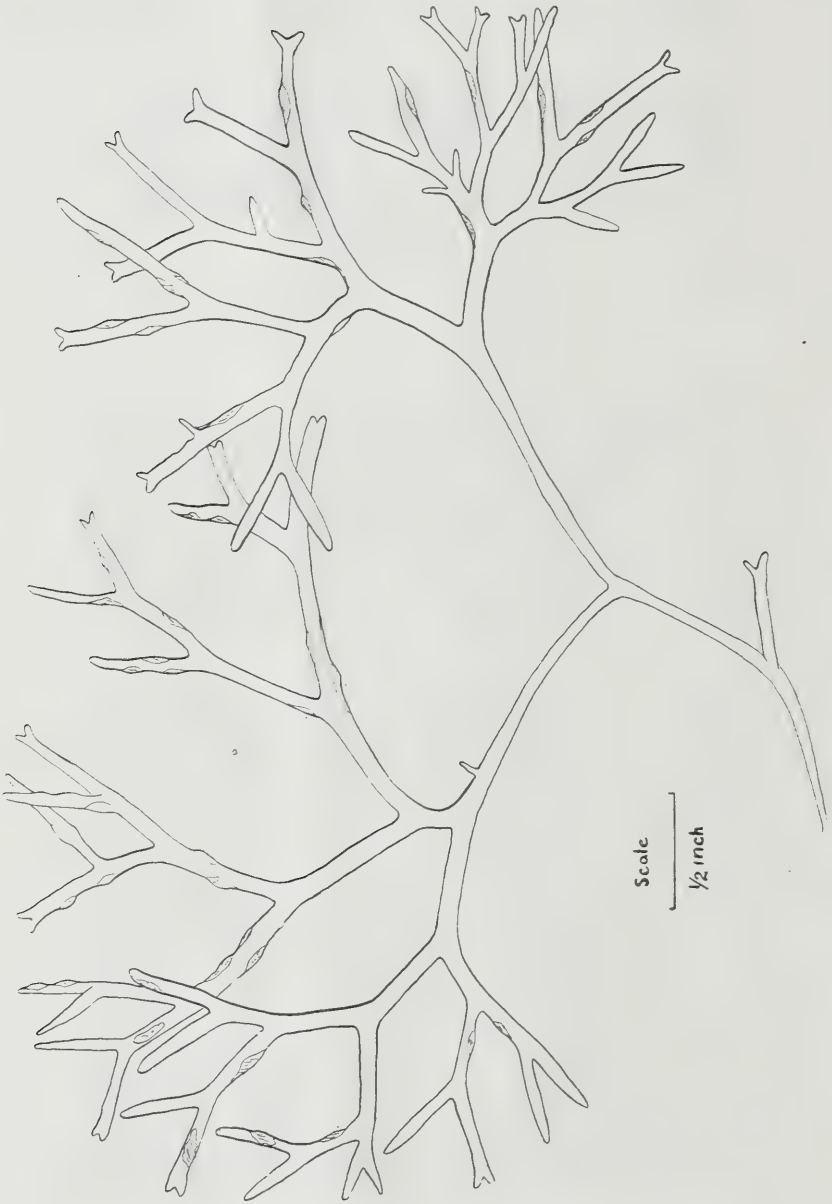

FIG. 1. Tetrasporic plant of *Gigartina pistillata* (Gmel.) Stackh.

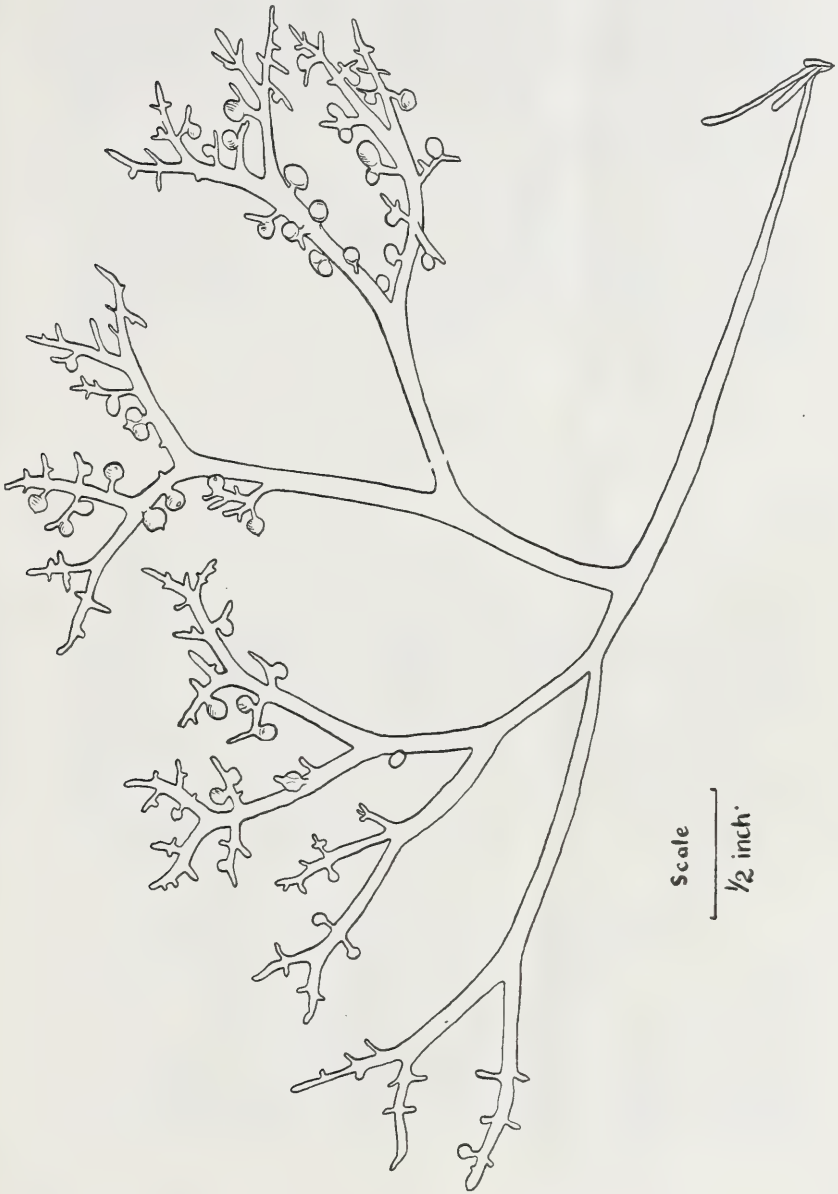

Fig. 2. Carposporic plant of *Gigartina pistillata* (Gmel.) Stackh.

be stalked. The presence of numerous ramuli gives the carposporic plant a distinct appearance since only occasional scattered ramuli are found on tetrasporophytes. The ripe cystocarps open to the outside by means of an apical pore (Fig. 3). The descriptions of Gmelin (1768), Dawson Turner (1808) and de Toni (1897) do not make it clear that the species

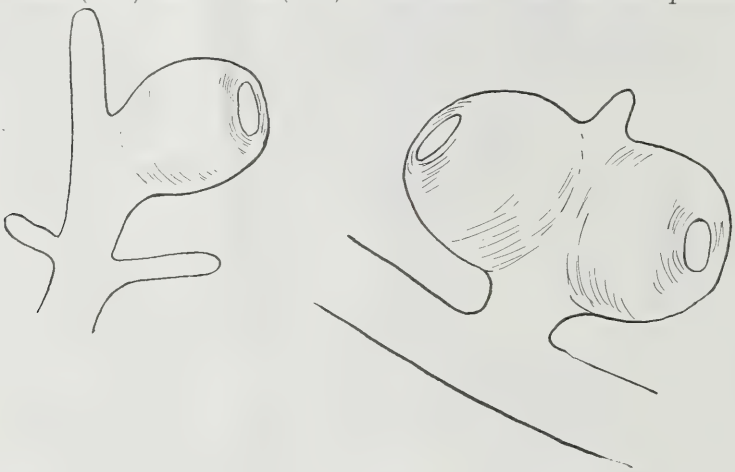

FIG. 3. Ramuli of *Gigartina pistillata* (Gmel.) Stackh. bearing cystocarps.

comprises two morphologically distinct plants, the type lacking numerous ramuli being possibly regarded as immature. Kützing and Harvey on the other hand, clearly recognize two forms within the species. A carposporic and tetrasporic plant are figured by Kützing in Plate I, Vol. 18, of his *Tabulae phycologicae* (1868) and the microscopic anatomy of these forms is figured in his *Phycologia Generalis*, Plate 70 (Kützing 1843). Harvey's comment is quoted below. "Barren specimens and those which produce tetraspores, have the forked branches usually naked; in tubercle-bearing individuals, on the contrary, they are pinnated with short, horizontal, simple or forked ramuli, two to three lines long". (Harvey, 1846-51.)*

In Stephenson's list of algae collected during his investigations on the intertidal ecology of South African shores (1947) *Gigartina pistillata* is listed with a question mark. The validity of the name for the South African plant was raised in correspondence with Professor G. F. Papenfuss

*Gmelin refers to the plant under *Fucus pistillatus* and figures (Plate 18) a portion of a carposporic plant only. Dawson Turner describes the plant under *Fucus gigartinas* and figures (Plate 28) the carposporic plant but includes smaller fronds without ramuli in his drawing. The other authorities quoted refer to the species under *Gigartina pistillata.*

who wrote: "Although, geographically, this species is rather far removed from the type locality, it clearly resembles the European plant and for the present I am regarding it as belonging to the same species". The material handled by us (Isaac 126, 127, 128) certainly corresponds to the description of the species given by the authorities already quoted. The species was also listed by Barton who erroneously gives the authority as J. Ag. (1893) and by Delf and Michell (1921).

In May 1951 *Gigartina pistillata* was collected by the senior author at Port Alfred (near Port Elizabeth). It is not a prominent species on the Port Alfred Coast but in one small area well protected from the force of the waves where the beach is uneven with small scattered boulders, *G. pistillata* was found to be a prominent species at low inter-tidal levels. In

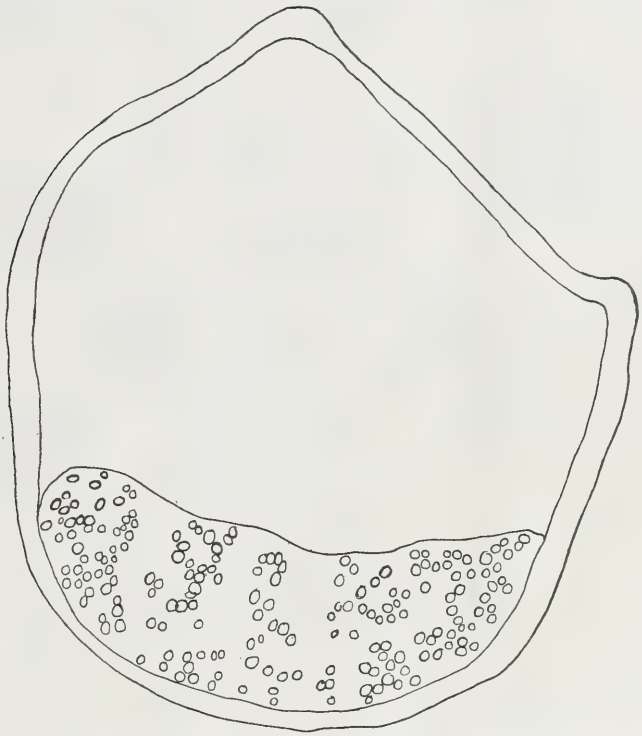

Fig. 4. Diagram of T.S. of branch of tetrasporic plant of *Gigartina pistillata* (Gmel.) Stackh. showing tetrasporangial region sunk in the thallus tissue.

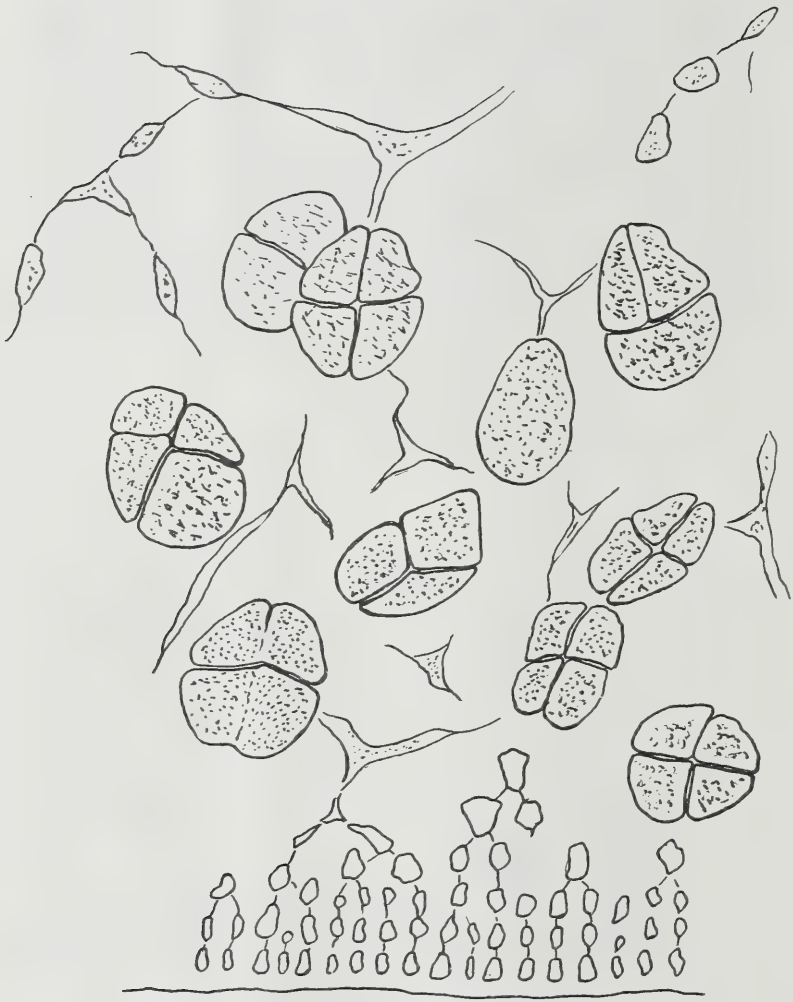

FIG. 5. Part of section shown in Fig. 4 more highly magnified. Note tetraspores cruciately arranged.

this region the seaweed vegetation at low intertidal levels is mostly dominated by *Hypnea spicifera* (Suhr.) Harv. although in situations less exposed to wave action *Caulerpa racemosa* (Forssk.) J. Ag., var. *zeyheri* (Kütz.) W. v. B. is the dominant species. In the very sheltered spot referred to above the algal vegetation was observed to be very mixed but with *Hypnea spicifera* relatively rare. On the whole, *G. pistillata* was dominant there being an admixture, it would seem, mostly of carposporic and tetrasporic plants but a few male and some sterile plants were identified. The plants of *G. pistillata* were observed to be a very dark bottle green colour although they dried on herbarium sheets to a dark brownish-purple. In the various descriptions seen of this species the colour is described as some kind of red or purple—dark bluish-red, dark red, a deep purple or somewhat purple. Dawson Turner, however, refers on the authority of Lamouroux to a smaller form (var. β) which

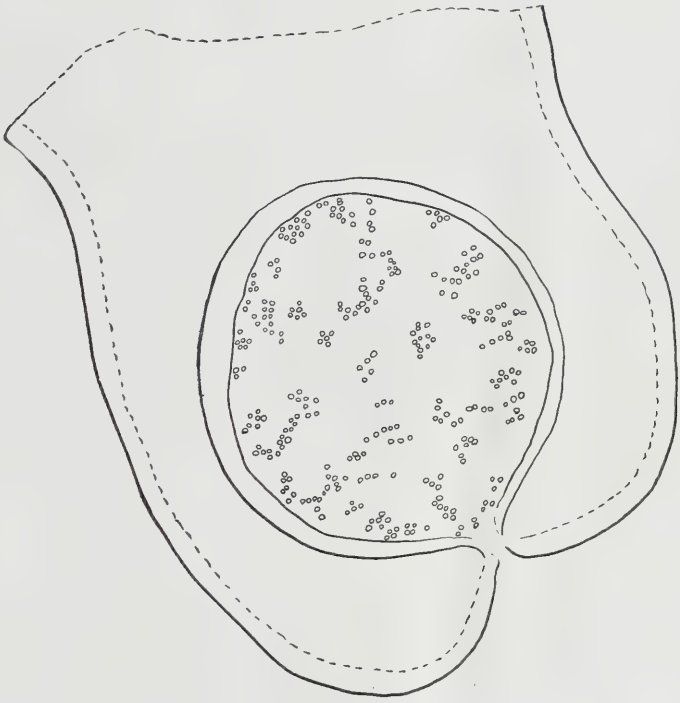

Fig. 6. Diagram of L.S. of cystocarp of *Gigartina pistillata* (Gmel.) Stackh.

varies in colour from green to reddish-purple. It may be that *G. pistillata* varies in colour in different parts of its geographical range and even in the same locality under different habitat conditions as is certainly the case with *Hypnea spicifera* (Isaac and Hewitt, 1953).

When sorting out the material collected at Port Alfred in May 1951, a few plants were noted with some branches bearing ramuli with cystocaps, these branches forming a very limited part of the whole plant (Plate VII). On more careful examination it became clear that these plants were fruiting, non-carposporic plants bearing a few cystocarpic branches. Sections showed that the plants were tetrasporophytes (Fig. 4) and many of the tetrasporangia were seen to contain four tetraspores cruciately arranged (Fig. 5). Sections showed also that the cystocarps contained carpospores (Figs. 6 and 7).

The work reported in this note was made possible by C.S.I.R. grants. Our thanks are due to the C.S.I.R. for this generous support.

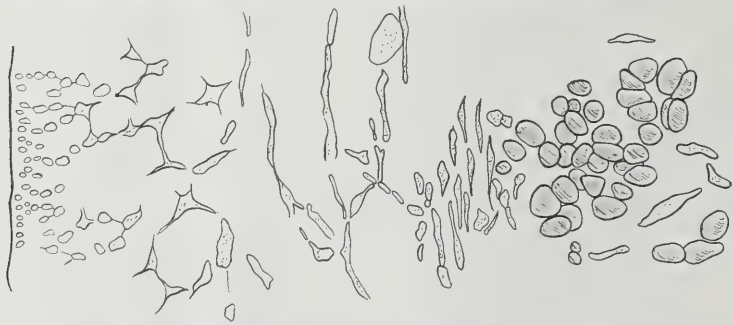

Fig. 7. Part of section shown in Fig. 6 more highly magnified.

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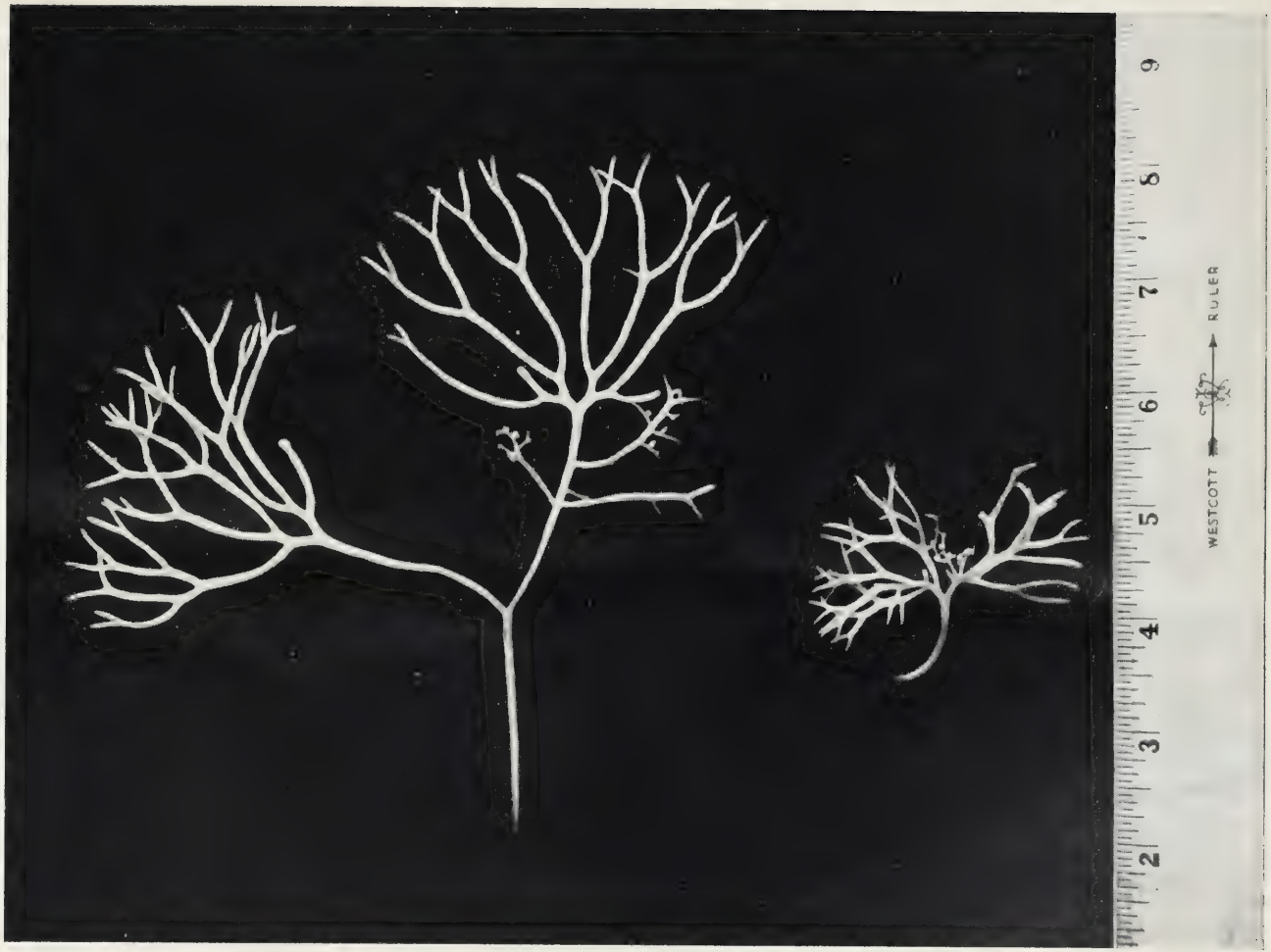

PLATE VII. Two tetrasporophytes of *Gigartina pistillata* (Gmel.) Stackh. bearing carposporic branches. (Scale in inches.)

THE IDENTITY OF *NOTHOLAENA BIPINNATA* SIM.

By E. A. C. L. E. Schelpe.

(*University of Cape Town.*)

In his second edition of the "Ferns of South Africa", Sim (1915) described *Notholaena bipinnata* as a new species. Since then the identity of this species has been in doubt. In the first edition of the same work this fern was named *Gymnogramme cordata* Schl. var. *bipinnata.*

An examination of the material upon which Sim (1915) based his *Notholaena bipinnata* has led the present author to the conclusion that this species is founded on firstly an abnormal frond of *Ceterach cordatum* (Thunb.) Desv. and secondly on normal sterile and fertile fronds of *Notholaena inaequalis* Kze.

Holland's sterile frond, without rhizome, which Sim (1892) named *Gymnogramme cordata* var. *bipinnata,* is in the herbarium of the National Botanic Gardens, Kirstenbosch. This frond was obviously the subject of Sim's pl. 109, fig. 2, in his second edition. The label to this specimen bears the inscription, "Namaqualand (not found by me) BHH", initialled by B. H. Holland. Consequently, there are no grounds for Sim's assumption in his second edition where he writes, "Mr. Holland's collection contained many Rhodesian ferns, so the probability is that his specimen also was from Rhodesia instead of Namaqualand". This statement might have been coloured by the Southern Rhodesian origin of the co-type of *N. bipinnata.* The glabrous dorsal surface of the frond, the ventral surface of the frond clothed with lanceolate pale brown scales, together with the dark castaneous stipe, rachis and pinna costae, and decrescent base of the frond lamina, strongly suggest that this specimen is a frond of *Ceterach cordatum.* Although the scales on the ventral surface of this frond are smaller than is usual on normal specimens of *Ceterach cordatum,* they exhibit comparable cellular structure.

The present author's view is that the Holland specimen is an abnormal frond of *Ceterach cordatum* possibly grown under shaded and moist conditions. Judging from its bipinnatifid to bipinnate character, it seems probable that this specimen belongs to the more dissected var. *namaquensis* (P. & R.) Sim. Since no shade forms of this variety appear to exist in South African herbaria, this view will require experimental substantiation. However, a specimen from the Olifant River (*Schlechter* 7999) in the Albany Museum is intermediate between the more usual var. *namaquensis* and the Holland specimen.

The other specimen on which *Notholaena bipinnata* was founded, *Eyles & Johnson* 1020 from Bulawayo, Southern Rhodesia, is in the Albany Museum Herbarium, Grahamstown. It consists of a plant with a rhizome bearing both fertile and sterile fronds. The indumentum on these fronds and the shape of the fronds and pinnae indicate that this specimen is *Notholaena inaequalis* Kze.

Sim's description (1915) of the indumentum of the frond of his *Notholaena bipinnata*, "Upper surface glabrous or slightly hairy, lower surface clothed with pointed brown scales or woolly tomentum", becomes understandable when one realizes that Sim's species was based on a Ceterach with a glabrous dorsal and a paleaceous ventral surface and on a Notholaena with a pubescent dorsal and a tomentose ventral frond surface.

The author wishes to thank the Directors of the Albany Museum and of the National Botanic Gardens for the opportunity to examine these specimens.

SUMMARY.

Notholaena bipinnata Sim is based on an abnormal frond of *Ceterach cordatum* (Thunb.) Desv. and normal fronds of *Notholaena inaequalis* Kze.

REFERENCE.

Sim, T. R. (1892): *The Ferns of South Africa*, ed. i. London.
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THE *CHEILANTHES MULTIFIDA* COMPLEX IN SOUTHERN AFRICA.

By E. A. C. L. E. Schelpe.

(*University of Cape Town.*)

The relation between *Cheilanthes multifida* Sw. and *C. Bolusii* Bak. has long been in doubt, especially since Sim's (1915) interpretation of the latter species. Even before the publication of the second edition of the "Ferns of South Africa" in 1915, Sim (1906) referred the more deltoid-fronded, as opposed to the oblong-fronded, section of this complex to *C. Bolusii* Bak.

In his synopsis of the genus Cheilanthes, Sim (1915) gives the following characters for the two species:

"*C. multifida.* Frond deltoid-oblong, usually twice as long as wide."

"*C. Bolusii.* Frond triangular, about as wide as long."

Furthermore, in his description of *C. Bolusii*, Sim (1915) writes, "Frond triangular, about as wide as long, four pinnatifid, three to six inches long, two to six inches broad", that is a length to breadth ratio of 1·5 to 1·0. Nevertheless he referred in the text to the specimen of *C. Bolusii* returned to Bolus from Kew after the wreck of the "Windsor Castle" and possibly drew his plate 106, fig. 2, from this frond (in the Bolus Herbarium). Both this specimen and his figure show frond laminae more than twice as long as the longest lowest pinnae (i.e. 2·6 and 2·4 times as long as the lowest pinnae respectively).

The figure accompanying the type description by Baker in Hooker's Icones Plantarum, t. 1636 (1886) shows a frond in which the lamina is 3·1 times longer than the lowest pinna. In addition, fronds of specimens collected at the type locality of *C. Bolusii*, i.e. the Darling Bridge over the Breede River, Worcester Div., Cape Province, by the author (*Schelpe* 4659, BOL) exhibit frond laminae 2·4 to 2·7 times as long as the lowest pinnae.

From this evidence it appears that *C. Bolusii* Baker is undoubtedly a synonym of *C. multifida* Sw. as previously suggested by Alston and Schelpe (1952).

Although Sim misapplied the name *C. Bolusii* to the more deltoid-fronded plants in the Transvaal and Southern Rhodesia, a critical examination of the relation of the population in these areas to the Cape Province and Natal populations of *C. multifida* has been considered necessary for the elucidation of this complex.

Sim (1915) intimated that the Transvaal and Rhodesian populations

included a greater proportion of deltoid-fronded individuals, and that the Cape Province and Natal populations generally exhibited a predominantly oblong frond lamina. This apparent difference between the two populations has prompted a statistical examination of the *C. multifida* complex. Since the main variable character between these populations appears to be the shape of the frond, the ratio between the length of the frond lamina and the length of the lowest pinna has been chosen for analysis. The wide variation in the proportion of dark to light coloured rhizome scales, even on single rhizomes, has precluded the use of this character in this discussion.

Another species which falls into that section of the Southern African Cheilanthes with glabrous fronds is *C. Dinteri* Brause. This plant is confined in its distribution to South West Africa as far as is known (Fig. 1). It can be separated from the *C. multifida* complex by its reddish rhizome scales and articulated pinnules.

ANALYSIS OF LAMINA SHAPE IN THE *C. MULTIFIDA* COMPLEX

Data on available specimens of *C. multifida* have been grouped primarily into Western Cape Province (west of 24 E. longitude), Eastern Cape Province (east of 24 E. long.), Natal, Transvaal, Southern Rhodesia and South West Africa. The secondary grouping is in districts proceeding eastwards in the Cape Province and northwards in Natal, Transvaal and Southern Rhodesia. Wherever possible, the locality, collector, collector's number and herbarium (abbreviation according to the Index Herbariorum, ed. ii) are cited for each specimen. The lamina length and lowest pinna length and the ratio between them is given for each frond measured. The analysis of the data is shown in Table I. Only complete fronds were measured, except in the small samples of Natal and Rhodesian specimens available, where some slightly incomplete fronds were measured. Imperfectly developed fronds have not been included.

	Lowest pinna length (cms.).	*Lamina length (cms.).*	*Lamina/ lowest pinna ratio.*
CAPE PROVINCE (WEST).			
CAPE PENINSULA:			
Cape Town, Oudekraal, *Marloth 688b* (PRE) ..	3·7	10·2	2·76
Cap. bon. spei, *Alexander s.n.* (PRE)	2·9	7·1	2·45
Lions Head, *Michell s.n.* (NBG)	2·0	6·8	3·40
Lions Head, *Thode A175* (PRE)	2·5	7·2	2·88
Lions Head, *Wolley Dod 2782* (BOL)	5·5	14·3	2·60
Spring Buttress, *Marloth s.n.* (PRE)	4·0	13·2	3·30
	4·2	10·4	2·48
Table Mountain, *Rawson s.n.* (SAM)	5·6	13·2	2·36

	Lowest pinna length (cms.).	*Lamina length (cms.).*	*Lamina/ lowest pinna ratio.*
MALMESBURY:			
Steenbergs Cove, *Compton 15920* (NBG)	2·1	6·4	3·05
Mamre Hills, *Compton 13762* (NBG)	3·1	10·7	3·45
PIQUETBERG:			
Langebaan, *Mathews s.n.* (NBG)	8·8	19·5	2·22
Piquetberg, *Zeyher s.n.* (SAM)	4·0	13·2	3·30
VAN RHYNSDORP:			
Van Rhyns Pass, *Taylor 2882* (NBG)	1·9	6·5	3·42
NAMAQUALAND:			
Lilyfontein, *Rodin 1440* (PRE)	1·9	4·9	2·58
PAARL:			
Paradise Kloof, *Adamson s.n.* (CT)	6·7	18·8	2·81
	6·3	19·2	3·05
Wemmershoek, *Esterhuysen 4078* (BOL)	3·2	7·6	2·38
Paarl Rock, *Steyn 51* (NBG)	4·8	10·4	2·17
WORCESTER:			
Bains Kloof, *Schlechter 9130* (PRE)	2·7	8·5	3·15
	2·9	8·5	2·93
Bains Kloof, *Schlechter 9130* (BOL)	3·6	9·0	2·50
Voetpadsberg, *Compton 17992* (NBG)	2·7	5·6	2·07
	1·8	4·1	2·28
Bains Kloof, *Schlechter 9130* (GRA)	3·4	8·1	2·38
CERES:			
Roggeveld Mtns., *Marloth s.n.* (PRE)	2·8	6·4	2·29
	3·1	7·9	2·55
Schwefteberg, *Esterhuysen 14729* (PRE)	2·9	6·9	2·38
Elandskloof, *Barker 3785* (NBG)	4·5	14·1	3·13
	3·6	11·5	3·19
Ceres, *Guthrie 3188* (NBG)	5·7	19·4	3·40
	5·4	14·7	2·72
TULBAGH:			
Tulbagh, *Pappe s.n.* (GRA)	3·0	8·6	2·87
	2·7	6·7	2·48
CLANWILLIAM:			
Scorpionsberg, *Barnard s.n.* (SAM)	2·9	9·7	3·34
	2·6	7·4	2·85
Pakhuis Pass, *Steyn 399* (NBG)	3·3	10·7	3·24
	3·2	8·9	2·78
Pakhuisberg, *Schlechter 8637* (GRA)	4·4	10·7	2·43
Clanwilliam, *Ecklon & Zeyher 76* (GRA)	3·6	8·9	2·47
Middelberg Plateau, *Compton 12722* (NBG)	5·0	11·7	2·34
	3·9	9·4	2·41

	Lowest pinna length (cms.).	*Lamina length (cms.).*	*Lamina/ lowest pinna ratio.*
MONTAGU:			
Kogmans Kloof, *Steyn 243* (NBG)	4·2	9·9	2·36
	3·8	8·9	2·34
Baden Kloof, *Compton 18343* (NBG)	7·1	14·4	2·03
LAINGSBURG:			
Constable, *Compton 9736* (NBG)	3·2	13·0	4·06
	3·2	12·9	4·03
Witteberg, *Compton 15221* (NBG)	4·3	8·2	1·91
	6·2	11·3	1·82
Whitehill Ridge, *Compton 13391* (NBG)	4·9	13·2	2·69
	1·8	2·9	1·61
	3·2	7·1	2·22
Whitehill Ridge, *Compton 5619* (NBG)	4·0	7·8	1·95
	4·1	9·3	2·27
Whitehill Ridge, *Barker 7813* (NBG)	3·2	6·1	1·91
	3·0	5·1	1·70
LADISMITH:			
Seven Weeks Poort, *Compton 7484* (NBG)	6·3	16·7	2·65
PRINCE ALBERT:			
Seven Weeks Poort, *Adamson s.n.* (CT)	5·0	13·5	2·70
	5·5	14·5	2·64
Seven Weeks Poort, *Thorne s.n.* (SAM)	3·5	9·7	2·77
CAPE PROVINCE (EAST).			
GRAAFF-REINET:			
Graaff-Reinet, *Bolus 329* (BOL)	14·4	25·5	1·77
SOMERSET EAST:			
Somerset East, *Bolus 329a* (BOL)	5·7	16·8	2·95
ALBANY:			
Amos Kloof, *Holland s.n.* (NBG)	12·2	28·6	2·34
	10·3	23·3	2·26
"Fairlands", *Killick 927* (PRE)	10·4	25·3	2·43
	8·5	22·5	2·65
Howiesons Poort, *Zeyher s.n.* (SAM)	5·6	17·5	3·13
QUEENSTOWN:			
Gwatyn, *Galpin 8199* (PRE)	5·5	14·3	2·60
KING WILLIAM'S TOWN:			
King William's Town, *Sim s.n.* (GRA)	3·8	11·4	3·00
King William's Town, *Sim s.n.* (PRE)	4·5	10·7	2·38
	2·2	5·8	2·64

	Lowest pinna length (cms.).	*Lamina length (cms.).*	*Lamina lowest pinna ratio.*
CATHCART:			
Toise River, *Acocks 9216* (PRE)	5·8	15·0	2·59
ST. MARKS:			
Main, *Young s.n.* (PRE)	1·7	4·1	2·41
XALANGA:			
Cala, *Young s.n.* (PRE)	5·1	13·8	2·71
	4·0	14·8	3·70
KOMGHA:			
Komgha, *Flanagan 1802* (GRA)	5·9	20·0	3·38
Komgha, *Flanagan 1802* (PRE)	4·8	19·5	4·06
LOCALITY UNPLACED:			
Redhill, *Rogers 11223* (GRA)	3·4	9·0	2·65
NATAL.			
ESTCOURT:			
Griffins Hill, *Acocks 11416* (PRE)	5·0	12·5	2·50
Tabamhlope, *Acocks 11459* (PRE)	3·3	7·6	2·30
	3·2	7·3	2·28
MTUNZINI:			
Ngoya, *Sim s.n.* (PRE)	1·9	4·2	2·21
VRYHEID:			
Vryheid, *McLoughlin 826* (PRE)	4·5	11·2	2·49
	5·3	16·8	3·17
LOCALITY UNPLACED:			
Highlands, *Schlechter 6842* (GRA)	9·2	20·5	2·23
TRANSVAAL.			
ERMELO:			
Dennebos, *Louw 1* (PRE)	4·0	10·4	2·60
Lake Chrissie, *Repton 1018* (PRE)	9·2	18·1	1·97
	9·0	16·8	1·87
CAROLINA:			
Carolina, *Moss & Rogers 1168* (PRE)	2·5	6·5	2·60
	3·8	5·4	1·42
	5·6	9·5	1·70
	5·3	9·2	1·74
PRETORIA:			
Erasmus Drift, *Bottomley s.n.* (PRE)	3·4	4·0	1·18
Hennops River, *Bosman s.n.* (PRE)	5·4	8·1	1·50
	4·6	6·6	1·43

	Lowest pinna length (cms.).	*Lamina length (cms.).*	*Lamina/ lowest pinna ratio.*
WITBANK:			
Klipfontein, *Mogg 12578* (PRE)	6·8	12·8	1·88
BELFAST:			
Belfast, *Doidge s.n.* (PRE)	11·7	15·6	1·33
	5·4	11·8	2·19
Van Brils Farm, *Bottomley s.n.* (PRE)	6·6	13·3	2·02
	5·8	10·8	1·86
BARBERTON:			
Barberton, *Thorncroft 31, 32* (PRE)	4·2	9·8	2·33
	4·8	8·2	1·71
Kaapsche Hoop, *V. Wager 83* (PRE)	4·6	6·8	1·48
	4·0	8·1	2·03
	4·4	8·6	1·95
Lomati Falls, *V. Wager 143* (PRE)	5·2	9·2	1·77
	2·2	5·4	2·45
Maid of the Mist, *Thorncroft 49* (PRE)	7·0	15·3	2·19
LYDENBURG:			
Branddraai, *Dyer 3964* (PRE)	4·1	6·2	1·51
Paardeplaats, *Pienaar 68* (PRE)	10·9	16·1	1·48
	8·3	14·1	1·70
PILGRIMS REST:			
Erasmus Kop, *Hardcastle 84* (PRE)	10·0	19·0	1·90
Kavyns Pass, *Schelpe 1654* (BOL)	7·5	18·5	2·47
Mt. Anderson, *Smuts s.n.* (PRE)	3·6	5·1	1·42
PIETERSBURG:			
Blaauwberg, *Esterhuysen 21284* (BOL)	7·7	14·2	1·84
LETABA:			
The Downs, *Junod 4040* (PRE)	2·5	3·6	1·44
The Downs, *Rogers 20135* (PRE)	9·5	15·0	1·58
ZOUTPANSBERG:			
Cyprus Point, *Junod 4068* (PRE)	5·1	9·7	1·90
	4·4	7·8	1·77
Piesanghoek, *Watson s.n.* (PRE)	8·2	14·2	1·73
LOCALITY UNPLACED:			
Makapans Poort, *Schlechter 4687* (GRA)	4·4	6·4	1·45
Makapans Poort, *Schlechter 4687* (PRE)	6·0	8·7	1·45
Six Miles Spruit, *Van Niekerk s.n.* (PRE)	4·2	5·8	1·38
SOUTHERN RHODESIA.			
MATOPOS:			
Matapos, *Borle 35* (PRE)	6·9	12·9	1·87

	Lowest pinna length (cms.).	*Lamina length (cms.).*	*Lamina/ lowest pinna ratio.*
BULAWAYO:			
Bulawayo, *Eyles & Johnson 1019* (GRA)	12·1	22·0	1·82
VICTORIA:			
Glen Livet, *Mogg s.n.* (PRE)	11·5	19·2	1·67
MELSETTER:			
Between Cashel & Melsetter, *Schelpe 4023* (BOL) ..	7·0	13·5	1·93
UMTALI:			
Murakwas Hill, *Chase 3977* (PRE)	12·0	21·4	1·78
Umtali, *Holland s.n.* (NBG)	8·3	16·8	2·02
Umtali, *Chase 4519* (PRE)	19·7	37·4	1·90
Vumba, *Fisher 1624* (PRE)	4·0	7·8	1·95
INYANGA:			
S. of Rhodes Hotel, *Chase 4918* (PRE)	13·0	17·9	1·38
	13·1	25·5	1·95
MAZOE:			
Ironmask Hill, *Eyles 247* (BOL)	7·2	13·5	1·88
Mazoe, *Eyles 247* (PRE)	5·0	9·0	1·80
	3·9	7·6	1·95
NORTHERN RHODESIA.			
Dobeka Bridge, *Milne Redhead 3104* (PRE) ..	11·5	18·5	1·61
SOUTH WEST AFRICA.			
GROOTFONTEIN:			
Hoba Hills, *Schweickerdt 9345* (PRE)	3·6	5·7	1·58
	3·8	5·5	1·45
Otavi, *Dinter 5511* (BOL)	6·1	8·5	1·39
Otavi, *Dinter 5511* (PRE)	7·0	10·0	1·43

This data has been presented graphically in the series of histograms shown in Fig. 2. It will be seen that the ranges of variation in the lamina/lowest pinna ratios between the various populations in each geographical area overlap. However, the arithmetical mean ratios appear to fall into two groups, firstly those of the Eastern and Western Cape Province and Natal populations and secondly those of the Transvaal, Southern Rhodesian and South West African populations. The significance of these means has been tested as shown in Table I.

Fig. 1. Map showing the distribution of *C. multifida* (circles) and *C. Dinteri* (triangles) in Southern Africa.

Table I.—Analysis of data of lowest pinna length/lamina length ratios in *Cheilanthes multifida* populations in Southern Africa.

Region	Number of samples (n)	Mean ratio (m)	Standard deviation	Standard error (ϵ)	$\frac{m_1 - m_2}{\sqrt{\epsilon_1^2 + \epsilon_2^2}}$
Western Cape ..	59	2·65	0·5276	0·0687	
					0·79
Eastern Cape ..	18	2·76	0·5463	0·1218	
					1·76
Natal	7	2·45	0·3366	0·1273	
					4·64
Transvaal	38	1·80	0·3666	0·0587	
					0·68
Southern Rhodesia ..	13	1·84	0·1656	0·0459	
South West Africa ..	4	1·46			
Northern Rhodesia ..	1	1·61			

From this evidence one may conclude that there is no significant difference in lamina/lowest pinna ratio between the populations in the Eastern and Western Cape Province and Natal on the one hand, and between the populations in the Transvaal and Southern Rhodesia on the other hand. However, there is a significant difference between the

ratios of the populations in Natal and the Transvaal, and an even greater significant difference between the ratios of the Western Cape Province and Transvaal populations in regard to this character.

Although very few specimens from South West Africa were available, the lamina/lowest pinna ratios of this population are much more comparable with those of the Transvaal and Southern Rhodesian populations than with the ratios in the Cape Province populations. The only Northern Rhodesian specimen seen has a lamina/lowest pinna ratio of 1·61, i.e. intermediate between the mean ratios of the South West African and Southern Rhodesian populations. Thus, on this character, the South West African population appears to belong to the Transvaal and Southern Rhodesian section and not to the Cape Province section of this species.

The distribution of *C. multifida* in Southern Africa (Fig. 2) shows it occurring in both winter and summer rainfall areas. In the drier and warmer regions within its distribution range it usually occurs only in

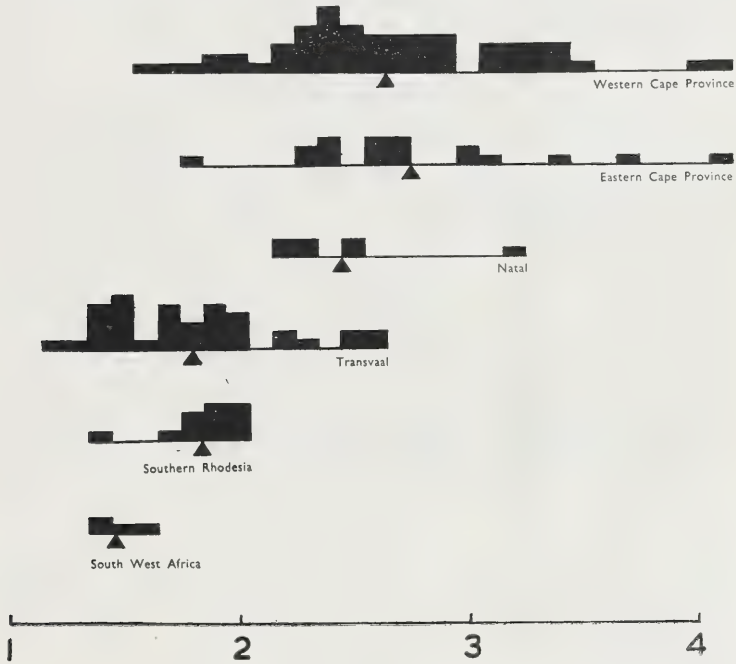

Fig. 2. Histograms of the frequency of specimens falling into 0·1 classes of lamina/lowest pinna length ratios in the populations of *Cheilanthes multifida*. A scale of ratios is given below; the mean ratio in each population is indicated by a triangle.

hilly or mountainous country where less desiccating conditions prevail. The known altitude limits of this species in the Western Cape Province are 1,000—5,000 ft., in Natal 4,000—5,800 ft. and in Southern Rhodesia 5,000—6,000 ft. It is almost invariably found in rock crevices or around boulders upon geological formations ranging from sandstones to dolomite. Although quite common in the South Western Cape Province, its general frequency decreases northwards from the Eastern Cape Province.

Consequently, it appears that a topocline exists within *C. multifida* ranging from the Western Cape Province, through the Eastern Cape Province, Natal, Transvaal, Southern Rhodesia and Northern Rhodesia to South West Africa.

Although on the available evidence the southern and northern populations within this species complex are significantly different in their lamina/lowest pinna ratios, the variations in this ratio in each geographical population largely overlap. Taking both these aspects into consideration, it is thought that the whole *C. multifida* complex is best treated as a single species, without the segregation of a separate variety.

ACKNOWLEDGEMENTS.

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SUMMARY.

On analysis of frond shape (lamina length/lowest pinna length ratios) of populations of the *Cheilanthes multifida* complex, it appears that a topocline in this character exists in this species ranging from the Western Cape Province, through the Eastern Cape Province, Natal, Transvaal, Southern Rhodesia and Northern Rhodesia to South West Africa. *C. Bolusii* Bak. is synonymous with *C. multifida* Sw.

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AN ECOLOGICAL SURVEY OF THE ADDO ELEPHANT NATIONAL PARK

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(With Plates VIII and IX.)

Throughout the chequered history of the Addo National Park questions that have constantly arisen are: what do the Addo Elephants eat and is there sufficient variety of natural food available for them in the Park? It was to answer these questions that the present ecological survey was undertaken in 1950—1952.

HISTORY

The need for such a survey becomes apparent when one considers the history of the Park and the difficulty of giving sanctuary to such large and dangerous animals so close to human habitation. Elephants were frequently encountered by the earliest travellers in the coastal regions of the Eastern Cape Province and there is no doubt that this was one of their natural homes. Lieut. William Paterson (I) in the course of his journey in 1779 crossed the Sunday's River and camped at a place he calls Sand Fleet. This was probably Sandflats which is about ten miles from the eastern boundary of the Addo Park. He records that "great numbers of quadrupeds inhabit this neighbourhood, such as Lions, Panthers, Elephants, Rhinoceroses, Buffaloes, Spring Bucks, etc." Antelopes and

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other game of the grassy plains south of Sandflats disappeared in the face of European settlement but elephant and buffalo and other bush dwellers were able to survive, albeit in diminished numbers, in the dense bush. That they did so is largely due to the peculiar nature of the vegetation, for the Addo Bush provided not only a sufficiency of food and a tolerable amount of water, but it also formed a barricade which daunted even the most intrepid adventurer. It is made up of succulent and thorny trees and shrubs rarely more than 10 to 15 ft. high. It is without the well-defined strata of a true forest and lacks any vantage points from which compass bearings can be taken. Narrow game trails twist and turn like the paths in a maze, then peter out, and within a few minutes of leaving a clearing a casual wanderer may lose all sense of direction and easily become hopelessly lost, once out of calling distance of his companions.

Apart from the dense bush cover, the lack of permanent streams and the climate with its intensely hot summers (maximum temperatures of 112° F.), prolonged droughts and irregular rainfall (averaging 15 inches per annum) were not conducive to the rapid expansion of agriculture. Nevertheless the clearing of bush on farms proceeded slowly and crops of wheat and maize were obtained in years of good rainfall. In 1922 the Lake Mentz Irrigation Scheme was started and brought about the development of one of the largest citrus producing areas of the Union on the irrigable land of the Sunday's River Valley adjacent to the Addo Bush.

As the human population increased and traffic on road and rail grew more frequent, the area of undisturbed bush grew less and the hazards caused by elephants to human life and their depredations among crops became matters of grave concern throughout the region. Drastic remedial measures were called for and in 1919 that famous hunter Major Pretorius was engaged by the Provincial Administration to shoot or otherwise destroy all the remaining elephants.

At this time there must have been about 126 to 150 elephants living in an area of 100 square miles (2) and the trouble they caused on surrounding farms indicates that even then they were overcrowded. By the middle of 1920 Pretorius records having shot 120 of them although other authorities put the figure at 110 (3). The arduous nature of the task and the change of public opinion in favour of preserving these unique animals brought an end to the slaughter when 16 to 30 individuals were left alive. In 1931 the Addo Elephant National Park was proclaimed, 5,268 morgen of bush covered country being set aside as a sanctuary for these animals (4) and a further portion was added in 1935 (5) bringing the total area up to about 8,000 morgen.*

*1 morgen = 2·1 acres; 305 morgen = 1 sq. mile.

Lydekker (6) considered that the Addo Elephant, which he named *Elephas africanus capensis*, was a distinct race from the West Cape Elephant (*E. a. toxotis*, Lydekker). His main reason for separating the two was that in the former "the ears are enormous, somewhat square in shape, with rounded corners, and a small, distinct, sharply pointed angular lappet in front", and that the ears of the West Cape race were "relatively larger and not having the slightest tendency to a squared form". Recent authorities including Allen (7) and Roberts (8) consider that the evidence put forward by Lydekker is insufficient and they include both Addo (East Cape) and Knysna (West Cape) forms with the African Elephant (*Loxodonta africana africana*, Blumenbach) the type locality being nominated as the upper Orange River district (8). In view of the very different climate and vegetation in such areas as the Knysna Forest and the Addo Bush it seems desirable that a close comparison of skulls of specimens from these two localities should be made before the question of nomenclature is finally settled.

The Park is administered from Pretoria by the National Parks Board of Trustees assisted by a local Advisory Board composed of representatives from the districts of Port Elizabeth, Alexandria and Uitenhage. A Game Warden is stationed in the Park and with the assistance of African rangers its boundaries are patrolled daily since the problem of keeping the elephants from wandering is an ever present one. During the citrus season up to 1,200 lb. of oranges are daily placed in a clearing near the Warden's house. The elephants come down at dusk to partake of these and are not unduly disturbed when floodlights are switched on so that they may be seen by visitors from a protected ramp about 150 yards away. At other times of the year prickly pears and wheat on neighbouring farms cause them to break bounds and wander sometimes 10 to 15 miles from the Park.

The problem of finding a suitable fence to keep the elephants within bounds is by no means an easy one. Yet the need for such a fence is urgent since from time to time farmers have shot and fatally wounded marauders on their lands and on more than one occasion the elephants have killed Africans in the Park. For a time an electrified fence was successful but when the elephants found ways of breaking through without receiving a shock this method had to be abandoned. More recently the Warden, Mr. Graham Armstrong, has erected a fence of tram lines and lift cables. This when tested was found strong enough to resist their efforts and its success has led to a new scheme in which the elephants are to be confined to about one third of the present area of the Park. The effect of their feeding and trampling on the vegetation in this comparatively small space will be discussed below after the general physiography and plant communities have been described.

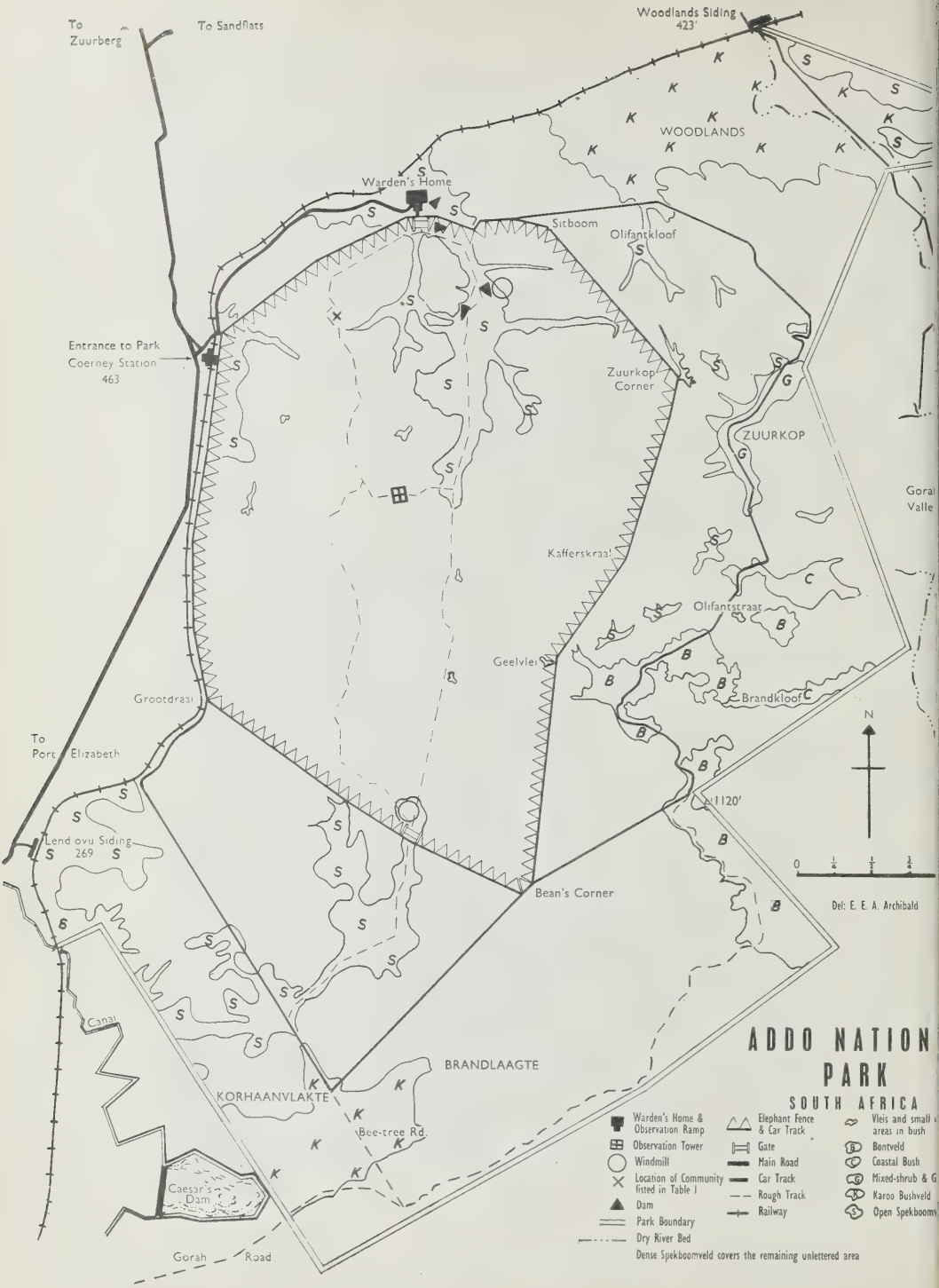
To Zuurberg
To Sandflats
Woodlands Siding 423'
WOODLANDS
Warden's Home
Sitboom
Olifantkloof
Entrance to Park
Coerney Station 463
Zuurkop Corner
ZUURKOP
Goral Valley
Kafferskraal
Olifantstraat
Geelvlei
Brandkloof
Grootdraai
To Port Elizabeth
Lend ovu Siding 269
1120'
Bean's Corner
Canal
BRANDLAAGTE
KORHAANVLAKTE
Bee-tree Rd.
Caesar's Dam
Gorah Road
N
0 1/4 1/2 3/4
Del: E. E. A. Archibald
ADDO NATIONAL PARK
SOUTH AFRICA
Warden's Home & Observation Ramp
Observation Tower
Windmill
Location of Community listed in Table I
Dam
Park Boundary
Dry River Bed
Elephant Fence & Car Track
Gate
Main Road
Car Track
Rough Track
Railway
Vleis and small areas in bush
Bontveld
Coastal Bush
Mixed-shrub & G
Karoo Bushveld
Open Spekboomv
Dense Spekboomveld covers the remaining unlettered area

PLATE VIII.

Aerial photograph of a portion of the Addo National Park showing dense growth of Spekboomveld and a small portion of bontveld (on right).

PHYSIOGRAPHY

The Park lies about 45 miles north of Port Elizabeth and covers an area of 8,000 morgen (about 17,000 acres). The highest point is on the Zuurkop escarpment (see Map), 1,120 feet above sea-level. This escarpment on the eastern boundary of the reserve is formed of limestone of the Alexandria Marine Series (Tertiary). To the west and extending over the greater portion of the reserve are undulating hills with an average altitude of 450 feet. They are covered by a light-red clay loam overlying Uitenhage Marine Beds (Cretaceous). On the northern side drainage is towards the Coerney River and on the southern side shallow valleys drain in a south-westerly direction into Caesar's Dam, a small reservoir on the irrigation canal.

Several small natural vleis occur in various parts but these are dry during the greater part of the year and the only permanent water supply in the reserve is from two boreholes, one of which is brack.

VEGETATION

The vegetation of the Sunday's River Valley and its immediate surroundings is classed by Pole Evans (9) and Acocks (10) as part of the Karoo Region, a semi-arid region in which, as Cannon (11) has shown, many plants have succulent leaves and stems or show other structural modifications related to the xerophytic habitat. The Addo National Park is situated in the most southerly section of this region and I know of no other locality where succulent, thorny bush attains such a dense and vigorous growth. Locally it is known as the Addo Bush, a name that might well be used to distinguish it from the Fish River Scrub in which species of Euphorbia such as *E. coerulescens* Haw. and its varieties are common.

From field surveys it was found that there are five main plant communities in the park. The area covered by each of these has been estimated and mapped from aerial photographs (Plate VIII). The most extensive plant community can be conveniently referred to as Spekboomveld since in it Spekboom (*Portulacaria afra*) is dominant. It covers more than 90 per cent. of the total area and it is one of the main sources of food for the elephants. The four minor communities will be described briefly first.

1. Karoo-bushveld.

This occurs on (*a*) Korhaanvlakte in the south-west corner of the reserve where the ground is flat but inclined slightly towards Caesar's Dam; (*b*) the north-east sector known as Woodlands. It covers about 7 per cent. of the total area and is an open community composed of low karroid shrubs not more than about 12 inches high. They occur singly or in groups

with areas of bare ground up to about 9 sq. ft. between the units. The most frequent species are *Pentzia globosa* Less. (Goedkaroo), *Justicia orchioides* L. f., *Lampranthus productus var. lepidus* Schwantes and two species of *Ruschia* (vygies), but even these are sparsely distributed and on Korhaanvlakte would not be found constantly on areas less than 16 sq. metres. With November rains the annual, *Sutera campanulata* O. Ktze. becomes abundant between the karco bushes. In parts a white efflorescence of salt can be observed on the soil surface and locally this type of veld is known as brackveld.

2. **Mixed Shrub and Grassveld.**

This mixed community of small shrubs and grasses forms only about 0·4 per cent. of the vegetation and is restricted to the limestone plateau on the eastern boundary of the Park known as Zuurkop. The soil over the limestone varies in depth, in some parts being as shallow as two inches. It is a dark yellowish-brown or greyish-brown sandy loam with a pH of 8·3. In spite of the comparatively high alkalinity of the soil the vegetation is known locally as zuurveld owing to the unpalatability of certain grasses to stock. It is an open community of small shrubs with ericoid leaves and grasses, and contains far fewer succulents and geophytes than the Karoo-bushveld community. Cover is sparse and no one species can be considered abundant, the most frequent occurring constantly only on areas larger than 16 sq. metres. Among the more common shrubs are *Polygala ericaefolia* DC., *Nenax microphylla* Sond., *Anthospermum cilare* L., *Agathosma capensis* Dummer. and *Walafrida decipiens* Rolfe. The grasses are best represented by *Eragrostis brizoides* Nees and *Sporobolus capensis* Kunth.

3. **Bontveld.**

The term bontveld is used here to describe a type of vegetation that is very characteristic of the coastal districts of the Eastern Cape Province. It consists of circular clumps of bushes up to 15 feet high and 30 feet in diameter dispersed in grassland or a mixed grass and low shrub community. The word "bontveld" (mottled ground) was used by the early Dutch settlers and is in common use amongst farmers in the Eastern Cape to-day. Speculation as to the cause and permanence of the bush clumps in bontveld would be out of place here, it being sufficient to note the extent of it in the Park and some of the most frequent species that characterize it.

Bontveld covers 3 to 4 per cent. of the area of the Park occurring chiefly on the Zuurkop plateau where a slight tilt gives the area the benefit of a southern aspect. It is convenient in describing this type of vegetation to split it up into the bush clump community and the surrounding community.

PLATE IX.

Addo Bush. Margin of bulldozed track showing dense growth of typical spekboom community, *Sansevieria* in undergrowth, *Portulacaria* and *Euclea* against sky line.

(*a*) *Bush Clump.* The area covered by each clump is comparatively small and although some plants appear to be more conspicuous, being larger or more profusely branched, it would hardly be correct to speak of any one species being dominant, since only a few individuals of each occur in a clump. However, comparing one clump with another, if they are well-developed and not obviously in the pioneer stage, one finds that some species are always represented in each clump whereas others are of only sporadic occurrence. Species of constant occurrence on the limestone plateau are *Scutia myrtina* Kurz., *Grewia occidentalis* Th., *Royena pallens* Th., *Gymnosporia buxifolia* Szyszy and *Rhus incisa var. obovata* Schonl. On the red loam of the Uitenhage series in the north-west corner of the reserve *Rhus longispina* E. & Z. and *Ehretia rigida* Druce are always likely to be present.

(*b*) *Surrounding Community.* On the northern boundary of the Park where *Rhus longispina* is conspicuous in the bush clumps, the chief constituents of the surrounding community are small karroid shrubs. One of the commonest is *Pteronia incana* Less.

However, on the limestone plateau, bontveld is characterized by the predominance of grasses in the surrounding community. No one species is really dominant but a number can be classed as frequent in contrast to the remaining species. They are *Themeda triandra* Forsk., *Panicum deustum* Nees, *Panicum maximum* Jacq., *Digitaria eriantha* Steud., *Elusine indica* Gaertn., *Eragrostis brizoides* Nees, *Eustachys paspaloides* Lanza and Matti, *Heteropogon contortus* Beauv. and *Cynodon dactylon* Pers. Two shrub species that are locally abundant are *Chascanum dehiscens* Moldenke and *Pelargonium multicaule* Jacq.

4. **Coastal Bush.**

Typical stands of Eastern Cape Coastal Bush occur in the south-west corner of the reserve in a kloof known as Brandkloof, and on the fringes of the Zuurkop plateau. Characteristic tree species are *Sideroxylon inerme* L. (Milkwood), *Schotia speciosa* Jacq. (Boerboon) and *Pterocelastrus tricuspidatus* Sond. (Kershout). The area is not extensive, forming only 1 per cent. of the total area of the reserve.

5. **Spekboomveld** (*Portulacaretum*).

This type of vegetation (Plate IX) covers the greater portion of the Park. The dominant species is *Portulacaria afra* Jacq. (Spekboom), which is also one of the main items of elephant diet. In the vegetation map open spekboomveld has been shown separately from dense spekboomveld. The open community has clumps of spekboom and other tree species interspersed with small succulent and karroid shrubs. It forms about 23

per cent of the total area, and occurs mainly in shallow valleys, around vleis and waterholes and on the margins of other communities. At the present time there is not sufficient evidence to state whether it is a natural marginal community or whether it has been artificially created as the result of grazing.

In dense spekboomveld karroid shrubs are absent and the bush and tree cover is thickly matted from three to fifteen feet above ground level. A careful survey of a typical portion of this community was made with a view to determining the frequency of occurrence of the main food species. For this purpose the Multiple Quadrat Method was used (13). As there was no continuous carpet of small herbs or other plants underneath the bush, the smaller sizes of quadrat were dispensed with and only three large sizes were used, namely 1, 16 and 64 sq. metres. Because of the tangled thorny nature of the bush the area of observation was limited to about 4 acres on either side of a bull-dozed track in a region where traces of elephant feeding were frequent. With the assistance of Mr. Graham Armstrong, and his African rangers, the sample areas or quadrats were laid out by means of a measured rope. The presence of each species within each quadrat was then recorded and the results are given in Table 1.

TABLE 1.

Analysis of Spekboom Community (Portulacaretum) in the Addo National Park. November, 1950.

Species.	Frequency of Occurrence of Species in a Total of 20 Quadrats. Quadrat Size in Square Metres.		
	1	16	64
Portulacaria afra	*15	20	20
Sansevieria thyrsiflora	*10	20	20
Azima tetracantha	10	19	20
Asparagus sp.	3	18	20
Capparis citrifolia	* 2	17	20
Rhoicissus spp.	* 5	15	20
Euclea undulata	* 4	15	20
Panicum spp.	* 5	13	20
Schotia speciosa	* 3	17	19
Asparagus subulatus	1	10	18
Crassula expansa	2	4	18
Rhus longispina	3	14	17
Sarcostemma viminale	2	9	16
Crassula perforata	—	4	16
Pelargonium peltatum	—	3	15
Crassula cultrata	—	8	14
Cadaba juncea	2	7	13
Gymnosporia spp.	* 5	10	12
Cineraria lobulata	2	5	12
Viscum rotundifolium	1	9	10
Carissa bispinosa	—	5	10

Species.	Frequency of Occurrence of Species in a Total of 20 Quadrats. Quadrat Size in Square Metres.		
	1	16	64
Maerua triphylla	—	5	9
Bulbine sp.	—	1	9
Commelina benghalensis	1	5	8
Cryophytum angulare	—	4	8
Asparagus africana	*—	3	8
Putterlickia pyracantha	?—	2	8
Poa sp.	3	5	7
Asparagus striatus	* 2	3	7
Rhus sp.	3	3	7
Behnia reticulata	2	2	7
Aizoon glinoides	2	4	6
Asparagus kraussii	—	2	6
Cyphia heterophylla	—	2	6
Plumbago capensis	—	2	6
Scilla sp.	—	1	6
Cynodon dactylon	* 1	3	5
Stipa dregeana	—	1	5
Crassula lycopodioides	—	—	5
Aster sp.	—	4	4
Commelina africana	1	3	4
Pteroxylon obliquum	1	3	4
Crassula turrita		1	4
Chenopodium sp.	1	2	3
Crassula rosularis		1	3
Cynanchum sarcostemmatoides		1	3
Delosperma No. 35	—	1	3
Abutilon sonneratianum	—	—	3
Delosperma No. 70	1	2	2
Atriplex sp.	—	2	2
Jasminum angulare	—	2	2
Delosperma No. 53	1	1	2
Aloe africana	*—	1	2
Euphorbia burmanni	—	1	2
Fockea edulis	—	1	2
Galenia pubescens	—	1	2
Grewia occidentalis	—	—	2
Solanum quadrangulare	—	—	2
Crassula spathulata	1	1	1
Asparagus sp.	—	1	1
Crassula argentea	*—	1	1
Gymnosporia capitata	—	1	1
Ceropegia carnosa	—	—	1
Euclea sp.	—	—	1
Eragrostis brizoides	—	—	1
Ipomea ficifolia	—	—	1
Oxalis sp.	—		1
Senecio sp.	—	—	1
Average number of species per quadrat	4·6	16·05	26·7
Total number of species in area sampled			71

*Indicates species eaten by elephants.

DISCUSSION

The smallest size of quadrat on which a species is found to be present constantly is a useful indication of the density of growth. For example in a grass sward where there is continuous cover the most frequent species has been found to be present constantly in an area of 25 sq. cms. (13). The size of the plant has of course to be taken into account, as far fewer individuals of a tree species can grow on a square metre of soil than individuals of a grass species. Consequently it is to be expected that the constant area of a tree species at maximum density will be greater than that of any herbaceous species at maximum density. It has already been stressed that in the Addo Bush *Portulacaria afra* (Spekboom) attains an exceptionally vigorous and dense growth and Table 1 shows that it was constantly present in sample areas of 16 sq. metres but only found in 75 per cent. of the sample areas of 1 sq. metre.

If left undisturbed *Portulacaria* grows into a much branched tree with a maximum height of 15 ft. and a trunk up to 9 ins. in diameter, the crown having a spread of about 10 ft. Such trees only exist where they are well protected by other vegetation as there is very little woody tissue in their stems and they are easily broken. The plants coppice freely and the usual form of propagation is from fallen stems, which retain their vitality for some time if conditions are not favourable for root production. Dense clusters of individuals 4 to 6 ft. tall are of frequent occurrence and because of this variable habit of growth it is very difficult to estimate the number of individuals per unit area.

The only other species with an area of constant presence equal to that of *Portulacaria* was a plant of the undergrowth, *Sansevieria thyrsiflora* (Bushman's Hemp), a member of the Liliaceae with rhizomes up to an inch thick and about 3 ft. long. The most frequent shrubby species was *Azima tetracantha*, a very thorny straggling plant belonging to the Salvadoraceae and having in this region a constant area of more than 16 sq. metres.

Within the area sampled a total of 71 species was found and an idea of their very scattered distribution may be obtained if we consider the "pattern unit" of the community. This pattern unit has been defined as the smallest area upon which an average of half the total species in the community can be expected to occur (14). For herbaceous communities, it has been shown (14) that the pattern unit where the cover is dense varies between 0·01 sq. metres and 1 sq. metre, and when cover is sparse and the component species very scattered, it may be as much as 1,000 sq. metres. For the *Portulacaretum* it would appear from a rough estimate that the pattern unit is of the order of 300 sq. metres.

ELEPHANTS AND THEIR FOOD

1. Plants Eaten.

Information about the natural food of the Addo Elephants has been obtained in two ways, firstly by observing their spoor and examining the plants after they have been feeding in a certain locality and secondly by an analysis of dry faeces. A list of these plants is given in Table II. Many of them occur in the Spekboom community where their frequency of distribution may be judged from Table I. Individual species that contribute most to elephant diet are *Portulacaria afra* and *Sansevieria thyrsiflora*, occurring in the Spekboomveld; *Schotia speciosa* and *Gymnosporia spp.* in Spekboomveld, bontveld and coastal bush communities; and several species of grasses, including *Cynodon dactylon*, *Panicum deustium* and *Panicum maximum*, which are to be found in bontveld, although these two also occur sporadically wherever there is an opening or clearing in spekboomveld. *Euclea undulata* was also reported by the former warden, Mr. Johnson, (*fide* Dr. John Hewitt), to be an important item of elephant diet.

TABLE 2.

Plants Eaten by Addo Elephants.

Species.	Common Name.	Part Eaten.	Evidence Field.	From Faeces.
Acacia karoo	Mimosa, Doring-boom	Bark of young shoots	†	
Capparis citrifolia	Wag-'n-bietjie	Roots	†	
Crassula argentea	t'Kerkai	Leaves and stems	*	
Euclea undulata	Gwarrie	Leaves, young shoots	*	*
Gymnosporia undulata	Pendoring	Roots chiefly, also shoots	**	**
Gymnosporia polyacantha	Pendoring	Roots chiefly, also shoots	**	**
Lebeckia cuspidosa	—	Bark of young shoots	†	—
Portulacaria afra	Spekboom	Leaves, stems	**	**
Putterlickia pyracantha	Pendoring	(Roots?)	?	?
Rhoicissus digitata	—	Leaves, stems	—	*
Schotia speciosa	Boerboon	Leaves	**	**
Aloe africana	Aloe, alwyn	Stem	†	—
Asparagus africana	Katdoring	Leaves, stems, (roots?)	?	*
Asparagus striatus	—	Leaves, stems	—	*
Cynodon dactylon	Kweekgras	Leaves, culms	**	*
Panicum maximum	Buffelsgras	Leaves, culms	—	**
Gramineae (at least 2 other species)	Grasses	Leaves, culms	—	**
Sansevieria thyrsiflora	Bushman's Hemp	Rhizomes	**	**

Species.	Common Name.	Part Eaten.	Evidence Field.	From Faeces.
Exotics ·				
Citrus	Orange ..	Fruit	**	**
Opuntia	Prickly pear ..	Fruit and young shoots	†	—
Ananas	Pineapple ..	Fruit	†	—
Triticum	Wheat	Leaves, grain	†	—

**Major food species.
†On authority of the Warden, Mr. Graham Armstrong.

The bark of young shoots of *Acacia karoo* and *Lebeckia cuspidosia* is also eaten by elephants. These species occur in very limited areas of two or three acres, the former just below the observation ramp and occasionally in zuurveld, and the latter as a subsidiary shrub in the grass of bontveld. Other food species occur mainly in spekboomveld but are also to be found in bontveld, coastal bush and zuurveld.

2. **Feeding Habits.**

Elephants obtain roots and rhizomes by swinging a forefoot to and fro and so kicking away the soil. Large thorny bushes of pendoring (*Putterlickia* and *Gymnosporia spp.*) are entirely uprooted in this way and much of the surrounding vegetation is also destroyed in the process. According to Selous (15) the tusks are also used in prising out roots. The food is grasped and brought to the mouth by the prehensile tips of the trunk. The African Elephant has two finger-like tips to the trunk instead of one as in the Indian Elephant. The delicacy of touch and manoeuvreability of these tips can be judged from the fact that they can strip the fine layer of bark off the young shoots of *Acacia* and *Lebeckia*, in both of which the growing points are protected by a barricade of sharp spines. With other plants whole branches are broken off and are pulled through the mouth by the trunk, as leaves and bark are being chewed off. With such succulent soft stemmed plants as spekboom, all the leaf and stem tissue is masticated and swallowed.

The dentition of elephants is very remarkable. According to Owen (16) the total number of teeth developed are $i = \frac{2+2}{0+0}$, $m = \frac{6+6}{6+6}$. Of the incisors (i) the first pair form two small milk-tusks which are deciduous; they are followed by the secondary incisors which continue to grow during the life-time of the animal, forming the tusks. In the female the tusks are less well developed than in the male.

Of the molars (m) only one, or a part each of two, on each side of both jaws, is in place and in use at any given time. Owen states that "the first molars are in place and in full use at three months and are shed when the

elephant is two years old". The subsequent molars grow forward in turn, perform their grinding functions for a period, wear away and are finally lost as new ones take their place. Each molar is like a massive compound tooth having a number of vertical plates of dentine each surrounded by a layer of enamel, the spaces between being filled with cement which binds the plates together and covers the whole tooth. As the tooth comes into use the cement crown is worn away and the enamel ridges, also wearing away, form an excellent grinding surface for the animal's vegetable diet. The pattern of the enamel ridges as exposed on the grinding surface is a further distinguishing character between the African and Asiatic elephants (Fig. 1.).

(*British Museum Guide Book.*)

Fig. 1.

A. Dentine pattern of molar tooth of African Elephant.
B. Dentine pattern of molar tooth of Asiatic Elephant.

With these massive teeth, elephants are capable of breaking up thick, tough woody stems and roots as well as soft leaf and fruit tissue. In the further processes of digestion all nutritive material is removed and in the droppings only the skeleton of roughage remains, including pieces of woody and fibrous plant tissue up to 5 inches long, fragments of bark and short pieces of stem still showing the structure of thorns. Seeds and bits of fruit are also found and, most useful of all for purposes of identification,

portions of dried leaves which, being eaten with surrounding fresh leaves, have passed through the tract practically unchanged. Spekboom material is easily distinguished from other plant material because of the fine network of fibrous tissue which is associated with the vascular system and which does not lose its character in the process of digestion.

The faeces are large and when air-dry weigh anything from 150 to 240 gms. The dry material can be separated into coarse fibrous remains of spekboom, coarse woody remains chiefly of pendoring, leaf tissue, and fine material. Since the recognisable leaf tissue only forms an insignificant portion of the total weight it has been omitted from Table III where analyses of faeces collected in the spekboom community and the bontveld with grass community are compared.

TABLE 3.
ANALYSES OF FAECES.

Sample No.	Community.	Coarse Portulacaria Fibre %	Coarse Woody Material %	Fine Material %	Total Weight per Ball (gms.)
1	Spekboomveld ..	14	41	45	164
5	Spekboomveld ..	37	14	49	235
8	Bontveld with grass	0·7	2·8	96·5	176
9	Bontveld with grass	0·6	—	99·4	171

Apart from the very different amounts of coarse material (woody and spekboom) present in droppings collected from different communities, a further difference in the diet of animals browsing in these communities is shown by the nature of the fine material. In spekboomveld it is estimated that at least half the fine material consists of finely shredded spekboom fibre while a large proportion of the remainder consists of small woody fragments. The fine material from the bontveld community has a much softer texture owing to the presence of a large quantity of short flattened pieces of the stems and leaves of at least three species of grass. This fine material is difficult to separate but it is estimated that about 50—75 per cent of it is grass, the remainder consisting of small woody fragments, fine *Sansevieria* fibre and a little spekboom fibre. Livingstone (15) and Heller (15) record having seen elephants eat grass but Selous (15) remarked that they "very rarely, I believe, eat any kind of grass". The evidence from faeces certainly indicates that at times grass forms an important item in the diet of Addo Elephants.

3. **Quantity of Food Required.**

In conclusion it seems necessary to try and make some estimate of the amount of food required by the Addo Elephants in order that the informa-

tion should be available for guidance in formulating future conservation policy for the Park. Since it is impossible to observe directly how much a wild elephant eats an estimate has been made in the following way.

Supposing spekboom to be one of the staple items of diet, on an average of samples 1 and 5 (Table III) 200 gms. of faeces contain about 50 gms. of coarse spekboom fibre and also about 50 gms of fine, i.e. 100 gms. in all. It was found that spekboom shoots of the size most favoured by the elephants were about five years old. They were 50 to 60 cms. long, weighed about 200 gms each and investigation showed that they would yield 10 per cent of air-dried fibre. Hence as a rough estimate the 100 gms. of fibre represent a total weight of 1 kgm. of fresh spekboom eaten for each ball of faeces passed. According to Benedict (17) a captive elephant showed an average of 16 defaecations of 5 balls each per day. Hence an Addo Elephant would require 80 kgms. (176 lbs.) of spekboom per day, or the equivalent of 400 five-year-old shoots. The remaining 100 gms. of coarse woody material and fine material in each ball comes from plants which are much less digestible than spekboom. It is estimated that as much as 20 per cent of the weight eaten will appear in the faeces. Hence this corresponds to a further 40 kgms. of plant material. The total food requirement of an elephant is thus estimated to be 120 kgm. (264 lbs.) per day.

It is of interest to compare this approximation with the amount eaten by the African Elephant at the National Zoological Gardens, Pretoria. The daily ration of this animal is:—

	Lbs.		*Lbs.*
Green lucerne	30	Dry grass	40
Dry lucerne	35	Oathay	20
Bran	6	Bread	4
Thick, yellow maize porridge ..	4	¼ lb. hops, a little treacle and occasionally pumpkins and kikuyu grass.	

This gives a total of 140 lbs. a day, but since 109 lbs. is dried or prepared food, the corresponding fresh weight is likely to be at least 250 lbs. According to Benedict (17) a herd of 18 female circus elephants (the Barnes herd) received during their working season about 170 lbs. each per day, part of which was dried food. It may be noted that the average weight of a circus elephant is 6,000 lbs. and it requires 50 gallons of water a day.

In judging these figures it must be borne in mind that captive elephants are fed largely on dried or prepared food and that they lead a very sedentary existence as compared with wild animals. Under natural conditions a considerable amount of energy would be expended on browsing, in play and in long tramps when changing territory. In the 8,000 morgen of Addo Park territory there are now 18 elephants, consisting

of 2 bulls, 9 cows and 7 calves, one of which is two months old (*fide* G. Armstrong, 9/6/52). They are restless animals and although they remain in an area of about 2,500 morgen for several days at a time they are constantly on the move. They feed at all times of the day but more particularly at dusk and during the hours of darkness. Some members of the herd may travel 15 to 20 miles at night across the boundaries of the Park and back again, returning to the vicinity of the herd to spend the daylight hours in browsing and resting. After a time the whole herd moves its daylight quarters to another section of the Park. Thus their feeding is at present spread over the whole area of the Park and not infrequently beyond its boundaries. With all this expenditure of energy, the estimate of 264 lbs. fresh weight per day as the normal food consumption of an adult animal cannot be considered excessive.

It is very difficult to make any reliable estimate of the grazing capacity of the Park in relation to the food requirements of the elephants. A working figure of 1 sq. mile per beast has been recommended (18); this figure was deduced as follows.

It has been suggested that an elephant eats the equivalent of 400 five-year-old shoots of spekboom a day. This vegetation would only be replaced after six years, i.e. about 2,100 days. During this time the animal must eat 840,000 shoots from other trees. Observation suggests that elephants destroy at least $1\frac{1}{2}$ times as much vegetation as they eat, so that 2,100,000 shoots should be available per six-year growth cycle. From the figures for the occurrence of spekboom in Table I it may be shown that, assuming a random distribution, there will be about 1 spekboom per square metre. Such a plant would have the equivalent of about 10 five-year-old shoots. Hence the elephant would require 210,000 such plants per six-year cycle, and these grow on 210,000 sq. metres, or 25 morgen. Spekboom develops into a well-grown tree in about 24 years, i.e., 4 cycles, and therefore to maintain the bush in a condition congenial to the elephants, with spekboom as the dominant species (Table I), at least 4 cycles must be allowed for regeneration. This leads to the figure of 100 morgen per animal.

There are various factors impossible to estimate at present, such as the proportion of other plants in the diet of the elephants and their need for a change of diet, e.g. from spekboom to grass, which probably accounts for their periodic changes of feeding ground. To allow for these it has been thought advisable to multiply the estimate made on the basis of spekboom by three, giving the round figure of 1 square mile per elephant.

At present the only conspicuous signs of deterioration of vegetation in the Park are to be seen around the bore holes, where constant rubbing and trampling prevent even the spekboom from regenerating. However, part of this trampling is due to other animals frequenting the bore holes,

especially buffalo, whose numbers in the Park have been variously estimated as between 180 and 400. For the purpose of this survey the presence of other animals has not been taken into account but they must also be considered as important factors when planning any future conservation policy. Kudu, Bushbuck, Grysbok, Steenbok and Duiker live in the Park; other animals include Jackals, Genets, Mungooses, Ratels, Polecats, Porcupines, Hares, Wild Pigs, Aardvarks (Antbears) and Vervet Monkeys.

In concluding this survey I strongly recommend that the enclosure of the elephants in any section of the Park should be regarded only as a temporary measure to prevent further annoyance to farmers and also indiscriminate shooting of the elephants. The reasons for this recommendation are that not only does an area of 2,000 to 3,000 morgen of spekboomveld contain insufficient food to support the Addo herd indefinitely, but that the animals require a change of diet and should not be confined to any one type of plant community. The ultimate objects should be (1) to add judiciously to the area of the Park by including such types of plant communities as are not well represented within its present boundaries and which provide useful sources of food for the elephants and other animals, and (2) to erect an elephant-proof fence around the entire reserve.

Note: The elephant-proof fence enclosing about 3,000 morgen and erected by the Warden, Mr. G. Armstrong, was completed early in 1954. The herd confined in this area now consists of 2 bulls, 8 cows (1 having presumably died during 1954) and 10 calves (2 born in 1953 and 1 in 1954).

E.E.A.A., November, 1954.

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A NEW SPECIES OF PECTINARIA.

By R. A. Dyer.

(*National Herbarium, Pretoria.*)

Pectinaria breviloba *R. A. Dyer,* sp. nov.; (Asclepiadaceae); affinis *P. arcuatae N. E. Br.* et *P. saxatili N. E. Br.*, sed ab ambabis corollae lobis multo brevioribus et ramis erectis caespitosis ab hac minus robustis et plus prominenter tuberculatis differt.

Planta succulenta, ramis erectis caespitosis, rhizomatis gracilibus incrementis; caules usque ad 5 cm. alti, 7—9 mm. crassi; obtuse 4-angulati, tuberculati, tuberculis 1·5—2 mm. prominentibus acutis. *Flores* 1—2 vel interdum usque ad 4 prope basin ramulorum juniorum seriatim evoluti; pedicelli graciles, 3—7 mm. longi. *Sepala* anguste lanceolata circiter 2·5 mm. longa. *Corolla* atropurpurea tubulosa, plus minusve ellipsoidea, 1—1·3 cm. longa, 5—6 mm. diametro, externe glabra et laevis, intra tubum infra medium pilis longis paucis instructa, basin versus minute tuberculata vel papillata; tubus 8—10 mm. longus, anguste urceolatus; lobi triangulares, 2·5—3 mm. longi, basi 2·5 mm. lati, apicibus connatis. *Corona* breviter stipitata; lobi exteriores atropurpurei, poculos emarginatos formantes inter lobos interiores et basibus adnati; coronae lobi interiores alaeformes vel umbonati, 3 mm. alti, 1 mm. lati, incurvi et apicibus supra columnam staminalem approximati.

Cape Province: Worcester Division; Tweefontein, *van Breda* 183 in National Herbarium, Pretoria (type); also at Kew.

A succulent plant with erect tufted branches and increasing by means of slender rhizomes; stems up to about 5 cm. tall, 7—9 mm. thick with 4 obtuse tuberculate angles; tubercles 1·5—2 mm. prominent, acute, terminating in a rudimentary leaf. *Flowers* 1—2 or occasionally up to 4 together, developed successively from near the base of young branches. *Pedicels* slender, 3—7 mm. long. *Sepals* narrowly lanceolate about 2·5 mm. long. *Corolla* maroon, tubular more or less ellipsoid 1—1·3 cm. long, 5—6 mm. diam. glabrous and smooth outside, with a few long hairs in the lower half of the tube within and minutely tuberculate or papillate near base; tube 8—10 mm. long, narrowly barrel-shaped; lobes triangular, 2·5—3 mm. long, 2·5 mm. broad across base, connate at tips. *Corona* shortly stipitate; outer corona lobes maroon forming shallow emarginate pockets between the inner corona lobes and united to their bases; inner corona lobes wing-like or hump-backed, 3 mm. tall, 1 mm. broad, incurved and the tips meeting over the staminal column.

In "The Stapelieae" by White and Sloane, 1937, six species of *Pectinaria* were recognised. N. S. Pillans added the procumbent species *P. mirkinii* in 1939 and *P. breviloba* is the eighth species in this notable genus. In his memoirs N. E. Brown remarks that the species are generally unimpressive at first glance but that the flowers reveal unsuspected beauty when viewed under a microscope; this applied particularly to his *P. asperifolia* with its papillae-adorned corolla.

The stems of most species of *Pectinaria* are procumbent and the tip of a branch may penetrate into the soil to re-root and form a new colony. In *P. breviloba* the branches are erect and tufted and new colonies are established by means of rhizomes.

In floral characters *P. breviloba* shows some affinity to *P. arcuata* and *P. saxatilis*. The corolla lobes are far shorter in proportion to the length of the corolla tube than in either of these species, however, and in addition to other less obvious differences the stems differ from those of *P. saxatilis* in their erect, tufted and more tuberculate habit.

Plants of *P. breviloba* were collected some years ago by Mr. P. A. B. van Breda, officer in charge of the Veld Reserve, Worcester, at Tweefontein in the Worcester Division of the Cape Province. They grow there under the protection of shrubs or rocks. Plants in cultivation flower, as the majority of the Stapelieae do, mainly in autumn.

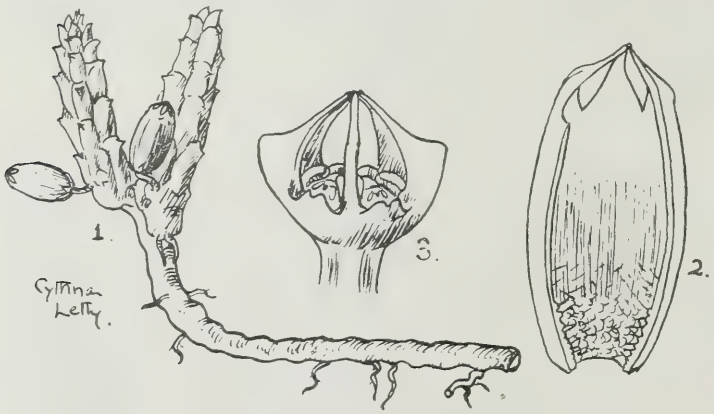

Fig. 1.

(1) Young growth in flower, natural size; (2) Corolla, x5; (3) Corona, x8.

THE GENUS *MERCIERA* A.DC.

By R. S. Adamson.

The small genus *Merciera* is endemic to the south-western part of the Cape Province. There are no certain records of its occurrence north of the Tulbagh division nor eastwards of that of Bredasdorp. The main concentration of species is in the Caledon division.

When it was founded by A. DeCandolle (Monog. Camp. 58 & 369. t5. 1830) the genus was called "*genus incertae sedis*" on account of the peculiar structure of the ovary. Since that time it has been placed in Campanulaceae and associated with the genera *Roella* and *Prismatocarpus*, especially with the former from which it has probably been derived.

A. DeCandolle originally recognised three species. Another was added by Buek (E. & Z. Enum. 387. 1837) but Sonder (Fl. Cap. 3. 596. 1865) reduced the number to two. Five species are now recognised.

In the course of this revision living material has been examined wherever possible. In addition to the author's own collections material from the following herbaria has been studied:—

Bolus Herb., University of Cape Town	BOL
Guthrie Herb., University of Cape Town.	CT
South African Museum, Cape Town	SAM
Compton Herb., Nat. Bot. Gds., Kirstenbosch.	NBG
Royal Bot. Gds., Kew.	K
British Museum (Nat. Hist.), London.	BM
Narurhist. Riksmus., Stockholm	S
Conservatoire de Botanique, Geneva.	G.
Botany School, Cambridge.	CGE
Dept. of Botany, Oxford.	OXF.

To the directors of these Institutions thanks are returned for the granting of facilities for the examination of specimens. The symbols used for the institutions are those in Lanjouw & Stafleu Index Herbariorum 1. Ed. 2. Regn. Veget. 2. 1954.

MERCIERA

A.DC. Monog. Camp. 58 & 369. t5. 1830.

Small shrublets or perennials woody at the base. *Stems* branched mostly from the base. *Leaves* crowded, alternate, fasciculate, linear, entire, often coarsely ciliate. *Flowers* axillary, sessile or almost so, solitary in

the axils. *Calyx* short. *Corolla* elongated, with a narrow cylindrical tube and more or less spreading lobes. *Stamens* free from the corolla, the filaments long and slender, not expanded at the base. *Ovary* wholly inferior, incompletely 2-chambered, with 4 basal ovules though rarely more than 1 or 2 developing. *Style* usually longer than the corolla, the stigma 2-fid. *Fruit* small, hispid, crowned by the persistent calyx, 1 or 2 seeded, indehiscent.

The type species is *M. tenuifolia* (L.f.) A.DC.

N.B.—It may be noted that E. P. Phillips (Gen. S. Afr. Pl. ed. 2. 753. 1951) quotes *M. leptoloba* A.DC. as the type species though he gives no reason for so doing.

Leaves most often edged by coarse white setose cilia. Calyx and ovary hidden by the crowded leaves. *Corolla tube* elongated, the lobes valvate. *Filaments* hairy except at the tip, the hairs often entangled with hairs on the inside of the corolla tube, giving an appearance of adnate stamens. *Ovary* small, barrel-shaped and coarsely hispid, 2-chambered at the base when young but 1-chambered when mature. *Fruit* not much enlarged, leathery, indehiscent, 1- or 2-seeded.

Galls on the flowers and especially on the ovary are common and result in a considerable amount of swelling.

All the species flourish especially where the surrounding vegetation is neither dense nor tall. They become largely suppressed in the climax phases. All are resistent to fire and sprout from the base after burning. The size and habit of the plants exhibit much variation in accordance with the time interval since a fire. The maximum degree of activity both vegetative and in flowering occurs 4—6 years after a fire.

In habit and leaf structure this genus is closely similar to *Roella* and especially the series *Ciliatae* of that genus, and suggests a derivation from that. The reduction in number of ovules and the indehiscent fruit might be correlated with the protection afforded by the crowded leaves and the sessile axillary position of the flowers. The long tubular corolla has parallels in other genera in the family, for example in *Prismatocarpus* subgen. *Afrotrachelium*, and in some species of *Wahlenbergia*. It is also found in *Rhigiophyllum* and in *Siphocodon* though in these genera it is associated with epipetalous stamens.

Key to the Species.

1. Leaves flat, usually coarsely seto-ciliate: stamens not longer than the corolla tube.
   2. Flowers blue, violet or purple.
      3. Leaves crowded, over 1 cm. long: flowers longer than the leaves.

4. Leaves ascending: corolla lobes hairy on the back .. .. 1. *M. tenuifolia.*
4. Leaves spreading: corolla lobes glabrous .. 1. *M. tenuifolia var azurea.*
3. Leaves scattered, less than 1 cm. long, flowers not or very slightly longer than the leaves: corolla lobes glabrous .. .. 2. *M. Eckloniana.*
2. Flowers white, rarely tipped with pink or purple:
5. Leaves rarely over 1·5 cm. long, spreading: corolla about as long as the leaves, the lobes spreading, shorter than the tube: style much exserted .. .. .. 3. *M. brevifolia.*
5. Leaves crowded, ascending, the lower over 2 cm. long: flowers slightly longer than the leaves: corolla lobes erect, about as long as the tube: style as long as the corolla .. 4. *M. leptoloba.*
1. Leaves trigonous, finely ciliate: stamens exserted, distinctly longer than the corolla tube .. .. 5. *M. vaginata.*

1. **M. tenuifolia** (L.F.) A.DC. Monog. Camp. 370. t5. 1830. *Trachelium tenuifolium* L.f. Supp. Pl. 143. 1781. *Roella tenuifolia* Thumb. Fl. Cap. ed. Schult. 174. 1823.

Stems woody, 15—30 cm. long, decumbent or sprawling but suberect at the tips. *Leaves* much crowded, ascending, 1—3 cm. long, commonly 1·5—2 cm., linear, flat, at the edges coarsely seto-ciliate either all along or in the lower half, more or less hispid on the back but glabrescent when old, the midrib below broad, about $\frac{3}{4}$ the width of the leaf. *Flowers* lateral or subterminal, as long as or longer than the leaves, violet, purple or blue-purple. *Bracteoles* 4—5 mm. long, keeled. *Calyx* lobes 1—2 mm. long, glabrous, keeled, acute, usually hyaline at the tip. *Corolla* tube 1·2—2·5 cm. long, occasionally white, the lobes 0·2—0·5 cm. long, acute, cucullate, hairy on the back either all over or on the middle line only. *Stamens* as long as or shorter than the corolla tube: *anthers* linear, 1·5 mm. long. *Style* as long as or longer than the corolla, glabrous or thinly hairy, thickened at the top. *Ovary* barrel-shaped, 1·5—2 mm. long, densely hispid.

The type is in herb. Thumberg, Uppsala. A. DeCandolle's type is *Ecklon* s.n. in herb. Dunant (G).

Heathy sands on mountains.

Variable in size and in the degree of hairiness, also in the number and position of the flowers. The hairs on the corolla lobes may be many or few and are often wanting in the older flowers. The stamens are most commonly as long as the corolla tube but in large flowered forms may be shorter, as short as half the length. Ripe fruit is rare, most of the ovaries being galled.

Tulbagh: Nieuwe Kloof, *MacOwan* 3103 (SAM). Paarl: Franschhoek Pass, *Compton* 21897 (NBG); *Pillans* 6749 (BOL. K). Caledon: Hottentots Holland, *Zeyher* 3153 (S); Kogelberg, *Esterhuysen* 1007 (BOL); Paarde-

berg. *Adamson* 4201: *Stokoe* 9113 (SAM): Palmiet River. *Adamson* 4166. 4908; *Esterhuysen* 12569 (BOL); *Stokoe* 8653 (BOL), sn. (BOL. SAM); Onrust, *Esterhuysen* 4229 (BOL); Heuning Klip, *Adamson* 4089 (CT), 4097; Grabouw, *Bolus* 4160 (BOL); Houwhoek, *Adamson* 4417; *Bolus* 6948 (BOL), sn. (BM. BOL); *Ecklon & Zeyher* 2417 (SAM); *Guthrie* 2275 (NBG); *Salter* 4056 (BM); *Schlechter* 7370 (BM. BOL. G.K.); *Pappe* (SAM); *Zeyher* 3152 (K.S. SAM); Caledon, *Marloth* 4767 (K); Aries Kraal, *Compton* 16832 (NBG).

Without Locality: *Dunant* (G); *Masson* (BM).

A specimen collected by *Bowie* (BM) has been labelled (in pencil) "Krantzbosch, George". If this is correct it marks a large extension of the known range. No recent collection has been made in that area.

Var. **azurea** Adamson comb. nov.

M. azurea Schltr. Bot. Jahrb. 24. 447. 1898.

Smaller and stouter than the ordinary form. *Stems* more or less erect, 5—15 cm. high, usually in groups. *Leaves* much crowded, spreading, often falcate, coarsely setose-ciliate on the lower part, rather broader and more rigid than in the type. *Flowers* crowded towards the tips of the branches, longer than the leaves. *Corolla* 0·8–1·0 cm. long, deep violet or purple-blue, the lobes glabrous.

The type is *Schlechter* 7263.

Exposed on rocky places on mountains. The non-ciliate part of the leaf varies from half the length to the tip only.

Tulbagh: Nieuwe Kloof, *MacOwan* 3103*b* (SAM). Caledon: Sir Lowry Pass, *Ryder* 65 (K); *Salter* 4157 (BM); *Schlechter* 7263 (BM. G.K. SAM); Steenbras, *Galpin* (K); *Moss* 1522 (BM); Kogel Bay, *Esterhuysen* 10007 (BOL); Rooi Els, *Esterhuysen* 13721 (BOL); Palmiet River, *Levyns* 5372 (CT); Kleinmond, *Barnard* (SAM); Onrust, *Esterhuysen* 4229 (BOL); Hermanus, *Compton* 14234 (NBG); *Leighton* 341 (BOL); Grabouw, *Bolus* 4160 (BOL); *Salter* 4157 (BM. K); Aries Kraal, *Compton* 16835 (NBG); *Leighton* 906 (BOL).

Without Locality: *Masson* (BM).

2. **M. Eckloniana** Buek in E. & Z. Enum. 387. 1837.

M. tenuifolia var. *Eckloniana* Sond. Fl. Cap. 3. 596. 1865.

Allied to *M. tenuifolia* but more slender and more branched. *Leaves* not much crowded, spreading or falcate-ascending, 0·5—1 cm. long, coarsely setose-ciliate but with few hairs on the back. *Flowers* in the upper axilis, usually confined to 1—2 cm. at the tip. *Corolla* deep violet, as long as or slightly longer than the leaves, the lobes spreading, glabrous. *Stamens* about as long as the corolla tube. *Style* exserted. *Ovary* densely hispid.

The type is *E. & Z.* 2420 (S).

Rocky places at rather higher levels than *M. tenuifolia*. In habit and general appearance like *M. brevifolia*. Very distinct in its typical form but sprouts coming up after a fire may have much crowded leaves.

Tulbagh: Waterfall, *E. & Z.* 2420 (S. SAM); Kluitjeskraal, *Esterhuysen* 1688 (BOL). Paarl: Wemmershoek, *Barker* 286 (NBG); Gem Peak, *Esterhuysen* 11424 (BOL); Franschhoek, *Schlechter* 9228 (G.K.); Franschhoek Pass, *Gillet* 755 (K); *Salter* 2965 (BOL. K). Stellenbosch: Easter Peak, *Esterhuysen* 14361 (BM). Caledon: Viljoens Pass, *Salter* 2030 (BM. K); Swartberg, *Bolus* 634 (BM. BOL. G.K.).

Without Locality: *Zeyher* sn. (S).

3. **M. brevifolia** A.DC. Monog. Camp. 371. 1830.

Stems woody, decumbent, much branched from the lower parts, 10—30 cm. long. *Leaves* not crowded, spreading, 0·8—1·5 cm. long, but rarely over 1·2 cm., the younger ascending, the lower usually falcate, glabrous but setose-ciliate at least in the lower half. *Flowers* white, lateral, as long as or shorter than the leaves. Flower buds clavate. *Bracteoles* 1·5—2·5 mm. long, mucronate. *Calyx lobes* 1—1·5 mm. long, mucronate, connate at the base. *Corolla* 0·5—0·8 cm. long, the lobes about 2 mm. long, ovate, acute, glabrous, usually spreading. *Stamens* as long as the corolla tube. *Style* usually longer than the corolla, sometimes as much as 1½ times as long. *Ovary* 1—1·5 mm. long hispid.

The type is *Masson* (BM).

Lower mountain slopes, especially among stones.

Specimens with more crowded and shorter leaves and small flowers were issued by Schlechter (7372) under the manuscript name, *M. muraltioides*, but these cannot be separated on any reliable features.

Tulbagh: Suurvlakte, *Stokoe* (SAM); Elands Kloof Mts., *Esterhuysen* 1688 (BOL). Worcester: Du Toits Kloof, *Drege* (CGE. G.K. OXF. S. SAM). Paarl: Dal Josaphat, *Tyson* 899 (SAM). Stellenbosch: Bottelary, *L. Bolus* (BOL. K); Faure, *Compton* 10372 (NBG); Somerset West, *Parker* 3455 (BOL), 3550 (BOL. NBG); Sir Lowry Pass, *Guthrie* 2792 (NBG); *Schlechter* 7211 (BM. G.K.). Caledon: Hottentots Holland, *Bowie* (BM); Houwhoek, *Adamson* 4899, 4901; *Guthrie* (NBG); *Schlechter* 7372 (BM. BOL. G.K.); Heuning Klip, *Adamson* 4096; Babylons Tower, *Zeyher* 3154 (BOL. K. S. SAM); Shaws Mt., *Compton* 10603 (NBG); *Salter* 5136 (BM. BOL. K.); Caledon, *Bolus* 9170 (BOL); Swartberg, *Bolus* 7402 (BOL); *Ecklon* 2418 (SAM); *Pappe* (K. S. SAM). Bredasdorp: Bredasdorp, *Galpin* 11316 (K); Elim, *Adamson* 4780.

Without Locality: *E. & Z.* 2419 (SAM); *Hooker* (G); *Zeyher* 1083 (K).

4. **M. leptoloba** A.DC. Monog. Camp. 371. 1830.

M. brevifolia var. *leptoloba* Sond. Fl. Cap. 3. 596. 1865.

Stems decumbent, woody, 10—30 cm. long, with groups of branches at the end of a year's growth. *Leaves* much crowded, the upper ascending, the lower spreading or partly falcate, decreasing in size from below upwards, the lower 1·2—2 cm. long. *Leaves* rather distantly setose-ciliate, the midrib below not more than a third the width of the leaf. *Flowers* white, lateral, usually shorter than the leaves. Flower buds cylindrical. *Bracteoles* 3—5 mm. long. *Calyx lobes* 1 mm. long, glabrous, acute or subacute. *Corolla* 0·8—1·4 cm. long, the lobes narrow, ascending, almost as long as the tube, 0·4—0·6 cm. *Stamens* as long as the corolla tube. *Style* as long as or slightly longer than the corolla. *Ovary* 1·2—2 mm. long, densely hispid on the upper half, the lower narrower and glabrous.

The type is a specimen from *Hooker* in herb. DC. (G).

Sand on lower mountain slopes.

The commonest species though not much collected by the earlier collectors. Easily recognised by the crowded leaves decreasing in size from below upwards, and by the lateral flowers with corolla lobes as long as the tube. Sonder (l.c) reduced this to a variety of the previous species, a procedure which has resulted in much confusion of the two in collections.

Cape: Steenberg, *E. & Z.* 2419 (S). Caledon: Sir Lowrys Pass, *Adamson* 4895; Kogel Bay, *Leighton* 2465 (BOL); Kogelberg, *Compton* 18951 (NBG); Palmiet River, *Adamson* 4046 (CT), 4162, 4180; *Compton* 6116 (NBG); *Levyns* 2667, 3848 (CT); *Pillans* 8207 (BOL); *Stokoe* 8654 (BOL), sn (SAM); Onrust, *Esterhuysen* 4954 (NBG); Hermanus, *Gillett* 628 (K); *Kensit* (BOL); *Leighton* 343 (BOL); Mossel River, *Potts* 5054 (SAM); Heuning Klip, *Adamson* 4095; Houw hoek *Adamson* 4898; *Bolus* 5105 (BOL); *Compton* 14225 (NBG); *Guthrie* (NBG); Caledon, *Zeyher* (S). Bredasdorp; Napier, *Adamson* 4774, 4775; Elim, *Adamson* 4776; *Esterhuysen* 19594 (BOL); Viljoens Hof, *Adamson* 4781; Zondags Kloof, *Compton* 10223 (NBG); Baardscheersbosch, *Compton*, 19016 (NBG); *Leighton* 2587 (BOL).

Without Locality: *Hooker* (G); *Thom* (K).

N.B.—Ecklon and Zeyher's record for the Cape Peninsula made more than a century ago has not been confirmed by any recent collector.

5. **M. vaginata** Adamson sp. nov.

Suffrutex suberecta dense foliata ramis brevibus. Folia supra concava subtus carinata basi late vaginata marginibus ciliatis nec setosis. Flores solitarii foliis brevioribus. Corolla saepissime 6-lobata. Stamina tuba corollae valde langiora. Fructus monospermus.

Stems woody, erect or suberect, 10—25 cm. high, with many short branches, densely clothed with leaves. *Leaves* rigid, ascending, 1·5—2 cm. long, acute, concave above, more or less keeled below, striate when dry, the base widened to a broad clasping sheath 4—5 mm. wide, the edges ciliate with fine hairs but not setose. *Flowers* mostly solitary, shorter than the leaves, mostly on the short branches. *Calyx lobes* 4—5 mm. long, acute, ciliate. *Corolla* pinkish-purple, the tube 8—9 mm. long, the lobes usually 6, 3 mm. long, acute, glabrous, spreading. *Stamens* usually 6, exserted 2—3 mm. beyond the corolla tube: *filaments* very slender, hairy on the lower part and loosely adherent to the corolla tube. *Style* hairy, slender, longer than the stamens. *Ovary* ovate, hairy. Fruit 1-seeded.

The type is Stokoe sn. (SAM).

Rare on the upper part of the Hottentots Holland Mts. Distinguished from all the other species by the long exserted stamens.

Caledon: Eastern slopes of Somerset Sneeuwkop, *Stokoe* (SAM).

Excluded species:—

M. heteromorpha Buek. in E. & Z. Enum. 387. 1837.
=*Carpacoce heteromorpha* Bolus J. Bot. 34. 25. 1896.

THE IDENTITY OF *ALOE SCHWEINFURTHII* BAK.

By G. W. Reynolds.

(With Plates X and XI.)

Baker (1) founded this species on Schweinfurth's gathering Ser. iii No. 167, the type locality being "Niamniam, at Makporru Hill, May 1870", but the identity of *A. Schweinfurthii* and its precise locality of origin have remained in doubt until recently.

In his third publication, Baker (2) records that the granite hill of Makporru is at lat. 4° 45′ N., long. 28° 30′ E., while Berger (3) stated that Schweinfurth told him that this species had not been introduced alive into Europe.

Schweinfurth's herbarium was destroyed during the war, it appears, but the holotype is at Kew.

Two figures of "*A. Schweinfurthii*" have been published, one in *Gard. Chron.* 23: ser. 3, 197, fig. 16 (1898), the other in *Bot. Mag. t.* 7667 (1899), but these far from represent *A. Schweinfurthii*. Berger refers them both to *A. aethiopica* (Schweinf.) Berger.

It was clear that nothing less than a personal visit to the type locality would ever enable me to establish the identity of this long-"lost" species, but the problem was to find the type locality. Where was Makporru Hill?

Dr. K. N. G. MacLeay, Department of Botany of the University College of Khartoum, very kindly made exhaustive enquiries in the Zande area of the Equatoria Province of the Sudan (the Niamniam-land of Schweinfurth), and also examined various maps, but was unsuccessful in locating any hill bearing the name of Makporru, although there was a small river of that name shown at 4° 50′ N., 28° 40′ E.

The solution was eventually found in Schweinfurth's book *The Heart of Africa*, English translation, 2 vols. London 1873. On 27th May, 1870, Schweinfurth had reached "Mount Baginze", and he records "Masses of brilliant Aloes, with their scarlet and yellow blossoms, grew luxuriantly upon the slopes of gneiss." (Vol. 2, p. 214).

Mount (Jebel) Bangenze can safely be accepted as the type locality. It is situated on the Anglo-Egyptian Sudan—Belgian Congo border, at c. 4° 28′ N., 29° E.

In May 1953, Mr. K. R. M. Anthony, then Acting Senior Research Officer of the Yambio Experimental Farm, specially visited Mt. Bangenze, found masses of Aloe plants in flower, and despatched five plants to me in Johannesburg.

After completing a survey of the Aloes of the eastern portion of the Belgian Congo, I reached Yambio, in the south-western corner of the A.-E. Sudan, on 9th July, 1954. The following day, Mr. E. M. McDermid, the entomologist at Yambio, and Mrs. McDermid, conducted me to Mt. Bangenze. For record purposes, the route from Yambio (320 miles west of Juba) led eastwards along the Maridi and Juba road for 50 miles, thence 17 miles southwards to near a small Zande village called Gbuo, and then along a track for 5 miles to the south-west. From that point, after a walk of two miles through tall-grass woodland, including a few hundred yards struggling through marshy ground densely filled with 15-ft. elephant-grass, Bangenze was reached, near the Congo border. Considerable numbers of only one species of Aloe were found there, many in flower, growing in scanty soil on granite, in shallow pockets or in crevices on slopes. They were *A. Schweinfurthii*, without doubt.

Photographs were secured, a full description prepared, and ample herbarium material gathered for Pretoria, Kew, Brussels and Nairobi.

A. Schweinfurthii can now, fortunately, be fully described and figured:

A. Schweinfurthii Bak. in *Journ. Linn. Soc.* 18: 175 (1880), in Th. Dyer *Fl. Trop. Afr.* 7: 467 (1898), non *Bot. Mag. t.* 7667 (1899); Durand et Schinz *Consp. Fl. Afr.* 312 (1893); Berger in Engler *Pflanzenr.* Liliac.-Aloin. 246 (1908), non *Gard. Chron.* 23: ser. 3, 197, fig. 76 (1898).

Stem none or short, with shoots forming small to large dense groups. *Leaves* 16—20, densely rosulate, the younger erectly spreading, older spreading and recurved in upper quarter, averaging 45 cm. long, (sometimes reaching 50—60 cm.), 6—7 cm. broad at base, gradually tapering to the apex; *upper surface* grey-green with bluish tinge, sometimes reddish-tinged, flat low down, canaliculate upwards, usually with several elongated dull whitish spots in lower third; *lower surface* convex, greyer-green than upper surface, usually with a few dull spots near base; *margins* sinuate-dentate, armed with pungent deltoid teeth which are reddish-brown at apices and paler near base, averaging 4 mm. long, 10—12 mm. distant, slightly hooked forward. *Sap* dries purplish.

Inflorescence a branched panicle averaging 90 cm. high.

Peduncle brown, slender, plano-convex and 15 mm. broad at base, terete upwards, 8—9 mm. thick at the middle, 8—10-branched from the middle or higher, the 1—2 lowest branches sometimes with 1—2 branchlets.

Racemes subdensely to sublaxly flowered, rather narrowly cylindric-conical, the terminal usually the longest and averaging 15 cm. long, 7 cm. diam., the buds suberect, scarlet and slightly grey-tipped, open flowers at first spreading becoming subpendulous.

Bracts small, ovate-acute, averaging 5 mm. long, 2—3 mm. broad at base, subscarious, dirty-white, rather thin, mostly 1-nerved.

Pedicels averaging 13 mm. long, lengthening in the fruit.

Perianth cylindric-trigonous, straight, averaging 28 mm. long, scarlet, turning orange at mouth or throughout, basally very slightly obtusely tapering to the pedicel, cylindrical and 7 mm. diameter across the ovary, thence very slightly narrowed on underside only, cylindric-trigonous above the ovary, the mouth open; *outer segments* free for 12 mm., paler at the edges, 3-nerved to base, the apices acute, spreading; *inner segments* free but dorsally adnate to the outer for half their length, broader than the outer and with 3 crowded nerves forming an orange keel throughout, the apices more obtuse, and more spreading to revolute.

Filaments pale lemon, filiform-flattened, the 3 inner narrower and lengthening before the 3 outer, with their *anthers* in turn exserted 2—3 mm.

Style yellow, with *stigma* at length exserted 4—5 mm.

Ovary brownish olive, 5 mm. long, 2·5 mm. diam. (Plate X.)

Material: *A.-E. Sudan:* Equatoria Prov., on Mt. Bangenze near the Belgian Congo border at c. 4° 28′ N., 29° E., alt. 2,600 ft., fl. 10 July 1954, Reynolds 7284 (PRE, K, BR, EA).

Belgian Congo: Oriental Prov., Kibali-Ituri Dist., Faradje Territory, 6 miles east of Aba, fl. 13 July 1954, Reynolds 7489 (PRE, K, B, BR).

Native Name: *Ranga* or *Rangambia* in the Azande tongue.

Distribution: *A.-E. Sudan:* Equatoria Prov., 5 miles east of Yambio; Mt. Bangenze; Loka West. *Belgian Congo:* Oriental Prov., near Doruma; Kurukwata, Faradje Dist., near the Sudan border; Bagbele, north-east of Dungu, near the Sudan border; abundant between Aba and the Sudan border; near Watsa; abundant on hills 9 miles west of Adranga, 68 miles east of Watsa.

Affinities: *A. Sereti* De Wild., from 6 miles north of Irumu, Belgian Congo, is a near ally, but differs in having mostly 3-branched inflorescences, and racemes with imbricate bracts entirely or partly obscuring the buds. *A. mubendiensis* Christian, from the Toro District of the Western Province of Uganda, is another close ally, but is distinguished by having a more branched inflorescence with more divaricate branching, and denser racemes with the flowers slightly secund.

References.

(1) *Journ. Linn. Soc.* 18: 175 (1880).
(2) *Bot. Mag. t.* 7667 (1899).
(3) Engler *Pflanzenreich* Liliac-Aloin. 246 (1908).

Acknowledgments.

I am indebted to:

The Director and Mr. E. Milne-Redhead of Kew, for photographs of the holotype at Kew (Schweinfurth's ser. iii, No. 167, *A. Schweinfurthii* Bak.).

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Mr. K. R. M. Anthony, Senior Research Officer of the Yambio Experimental Farm, for making a special journey to Mt. Bangenze in 1953 to collect specimens and send them to Johannesburg, and for much other assistance.

Mr. E. M. McDermid, Entomologist at Yambio, for arranging transport and conducting me to Mt. Bangenze, and for providing several other facilities.

To the South African Council for Scientific and Industrial Research, I am indebted for a travelling grant which enabled me to undertake an expedition of 11,700 miles through the Belgian Congo to the Sudan and back, investigating the Aloes of Tropical Africa, of which *A. Schweinfurthii* Bak. was one.

Fig. 1.

Fig. 2.

Fig. 3.

Plate X. *Aloe Schweinfurthii* Bak.

Fig. 1. Flowering plant on Mt. Bangenze, Equatoria Prov., Anglo-Egyptian Sudan, fl. 10 July, 1954. Height 90 cm.
Fig. 2. Flowers 1/1 from bud to post-pollination stages.
Fig. 3. Various flowers 1/1, showing variation.

FIG. 1.

FIG. 2.

FIG. 1. Plants between Aba and the Sudan border, Oriental Prov., Kibali-Ituri Dist., Belgian Congo. Fl. 13 July, 1954. Height 85 cm.

FIG. 2. Flowers 1/1 from bud to post-pollination stage.

PLATE XI. *Aloe Schweinfurthii* Bak.

A NEW ALOE FROM TANGANYIKA

By G. W. Reynolds.

(With Plate XII.)

In October 1940, Mrs. E. M. Tweedie of Endebess, Kenya Colony, collected specimens of this species on sandstone hills at Bukoba, overlooking Lake Victoria, in the North-western Division of Tanganyika Territory. Mrs. Tweedie sent some of those plants to the late Mr. H. B. Christian, who grew them at "Ewanrigg" near Salisbury, Southern Rhodesia.

When one of them subsequently flowerd, Mr. Christian photographed it, but no description was drawn up.

On 1st August 1954, I visited Bukoba for the express purpose of investigating this undescribed species, and was fortunate to find numbers of plants in flower on the sandstone hills to the west of Bukoba Harbour, at the locality where Mrs. Tweedie had first discovered them. Photographs were secured and a description drawn up on the spot, while herbarium material gathered then was subsequently contributed to the National Herbarium Pretoria, to Kew and to the East African and Coryndon Museum herbaria in Nairobi.

The species can now be described and figured, and under the name which Mr. Christian provisionally assigned to it.

A. bukobana occurs in fairly large numbers on rocks in shallow pockets of soil, also in fissures on the grey sandstone hills at and near Bukoba, in an area receiving about 60 in. of annual rainfall. Plants sucker freely and form dense compact groups, and are variable in branching of the inflorescence, and in the length and shape of flowers.

In leaf characters, kind of inflorescence and flowers with trigonal indentations above the ovary, *A. bukobana* is nearest allied to *A. Chabaudii* Schonl., which occurs in the Rhodesias, Southern Nyasaland, Mocambique, and South Africa. Compared with *A. Chabaudii*, *A. bukobana* is a smaller plant having smaller leaves and rosettes, and very laxly-flowered racemes.

Aloe bukobana Reynolds. Sp. nov. in Sect. *Aethiopicae*, *A. Chabaudii* Schonl., affinis.

Planta succulenta, acaulis, caespitosa. *Folia* ca. 16, dense rosulata, lanceolato-attenuata, 30 cm. longa, 8 cm. lata, glaucescentia, immaculata, supra plana, apicem versus canaliculata, subtus convexa; margines sinuato-dentati; dentes detoidei, 4 mm. longi, 10 mm. distantes. *In-*

florescentia paniculata, 70—90 cm. alta. *Racemi* laxissimi, 30—40 cm. longi. *Bracteae* parvae, ovato-acutae, 4 mm. longae, 3 mm. latae. *Pedicelli* 12—14 mm. longi. *Perigonium* 30—35 mm. longum, cylindraceo-trigonum, leviter decurvum, circa ovarium 7—8 mm. diam., supra ovarium leviter trigono-constrictum, deinde apicem versus ampliatum; segmenta exteriora per 7 mm. libera. *Antherae* 1—2 mm. exsertae. *Stigma* demum 2—3 mm. exsertae. *Ovarium* 6 mm. longum, 3·5 mm. diametro.

Tanganyika Territory: North-western Division, Bukoba District, on sandstone hills overlooking Bukoba Harbour and Lake Victoria, alt. 3,900 ft., fl. 1 August 1954, Reynolds 7507 Holotype (PRE), isotypes (K, EA).

Plant succulent, acaulescent, suckering freely and forming small dense groups.

Leaves about 16, densely rosulate, the youngest suberect, older spreading, lanceolate-attenuate, averaging 30 cm. long, 8 cm. broad at base, about 14 mm. thick; *upper surface* dull green with a slight bloom, unspotted, flat low down, very slightly canaliculate towards apex; *lower surface* convex, grey-green, without spots or markings; *margins* sinuate-dentate, armed with firm deltoid brownish-tipped teeth averaging 4 mm. long, 10 mm. distant, the apex a small spine. *Sap* dries yellow.

Inflorescence a branched panicle 70—90 cm. high, erect or suberect, the whole inflorescence slender with slender branches.

Peduncle basally plano-convex and 10 mm. broad, terete upwards, branched below the middle with up to 10 branches, the lowest sometimes with 1—2 branchlets; lowest branch subtended at base by a broadly deltoid subfleshy many-nerved acuminate bract 35 mm. long, 14 mm. broad.

Racemes very laxly flowered, the terminal averaging 30—40 cm. long, narrowly conic-cylindric; the buds grey-green tipped, spreading, with their pedicels more or less horizontally disposed, open flowers nutant to subpendulous; in oblique racemes, flowers spreading laterally each side of the axis, and not secund.

Bracts small, broadly and shortly ovate-acute, 4 mm. long, 3 mm. broad, thin, subscarious, 3-nerved.

Pedicels spreading, averaging 12—14 mm. long.

Perianth dull scarlet, paler at mouth, 30—35 mm. long, cylindric-trigonous, varying from slightly rounded at base to obtusely tapering into the pedicel, and from not stipitate to shortly stipitate, cylindric and 7—8 mm. diam. across the ovary, thence trigonously indented, slightly curved, and enlarging slightly to an open mouth; *outer segments*

free for 7 mm., paler at the margins, with subacute slightly spreading apices; *inner segments* dorsally adnate to the outer for their greater length, broader than the outer, with more obtuse more spreading apices, and with 3 crowded nerves forming a scarlet keel.

Filaments lemon, filiform-flattened, the 3 inner narrower and engthening before the 3 outer with their *anthers* in turn exserted 1—2 mm.

Style lemon-yellow, with *stigma* at length exserted 3 mm.

Ovary greenish-yellow, 6 mm. long, 3·5 mm. diam. (Plate XII.)

Native Name: "*Nkaka*" in the Kihaya tongue of the Bahaya tribe of Bukoba, Tanganyika Territory.

Acknowledgments.

I am indebted to the South African Council for Scientific and Industrial Research for a travelling grant which enabled me to investigate this and many other species of Aloe in various parts of Tropical Africa.

To Mrs. E. M. Tweedie of "Mutamayo", Endebess, near Kitale, Kenya Colony, I am indebted for plants, and also for a detailed map indicating the precise locality, and for much other assistance.

Fig. 1.

Fig. 2.

Fig. 1. Plant on sandstone hill overlooking Bukoba Harbour and Lake Victoria, North-western Division, Tanganyika Territory. Fl. 1 Aug. 1954. Height 80 cm.

Fig 2. Flowers 1/1 from bud to post-pollination stage.

Plate XII. *Aloe bukobana* Reynolds.

THE IDENTITY SYNONYMY AND DISTRIBUTION OF *ALOE DAWEI* BERGER

By G. W. Reynolds.

(With Plates XIII—XVI.)

Aloe Dawei was described by Berger in *Notizblatt Berl. Bot. Gart.* 246 (1906), from material gathered by Mr. Dawe, at that time Curator of the Botanical Gardens at Entebbe, Uganda. Berger recorded that the species occurred abundantly in the neighbourhood of Entebbe, and flowered from January to March, and also from June to September.

There are no recorded figures, while Professor G. Werdermann, Curator of the Botanical Gardens at Dahlem, Berlin, informed me that the type was not in Berlin and could not be traced. In order to establish the identity of *A. Dawei*, a personal visit to the type locality became a necessity.

On 26th April 1952, I visited Entebbe for the express purpose of investigating this species, and although I saw many plants at Hippo Bay, Lake Victoria, near Old Entebbe, none was then in flower and none had flowered shortly before that time.

A few days later I visited Kisumu, also on Lake Victoria, but in Kenya Colony, and found numbers of plants at the foot of the Nandi escarpment, but these too were not in flower then.

On 3rd August 1954, I again visited Entebbe, and then fortunately found numbers of plants of *A. Dawei* in flower at several localities near Entebbe. (Plate XIII.)

A full description was drawn up on the spot, photographs were secured, and several sheets of herbarium material prepared for various herbaria.

Five days later I visited Kisumu again and found numbers of Aloe shrubs in flower along the foot of the Nandi escarpment, two to four miles north-east of Kisumu on the road to Kakamega, and also for about seven miles along the road to Yala, north-west of Kisumu. (Plate XIV.) *A. Pole-Evansii* Christian then became involved.

In August 1938, specimens of this species were collected by Mr. J. Erens (on the Pole Evans Central and East African expedition) about six miles north-west of Kisumu on the road to Yala. When a young plant flowered in the gardens of the Division of Botany, Pretoria, for the first time in October-November 1939, it was figured and described in *Fl. Plants S. Afr.* 20: Plate 782 (1940) under the name *A. Pole-Evansii* Christian. The raceme figured on Plate 782 is of a young plant of modified garden growth

and is not typical of racemes of adult plants at the cited type locality of *A. Pole-Evansii.*

I studied large numbers of flowering specimens at Entebbe and near Kisumu, and found that they were clearly conspecific.

A. Pole-Evansii should, therefore, unfortunately, be reduced to synomymy under the earlier *A. Dawei.*

In the meantime another shrubby species of Aloe, from the Belgian Congo, had become involved, namely, *A. beniensis* described by De Wildeman in *Plantae Bequaertianae* 1: 25 (1921), the type being: "Between Beni and Kasindi, 11 August 1914, J. Bequaert No. 5255—Grassy savanna amongst candelabra Euphorbias, shrubby, flowers red."

Beni is in the North Kivu District of the Kivu Province, lying to the West of Ruwenzori. Kasindi is the Belgian Customs post on the Uganda border, about 35 miles south-east of Beni, north of Lake Edward, south of Ruwenzori, and east of the Semliki River.

The collector, Dr. J. Bequaert, had previously informed me that he collected *A. beniensis* in August 1914 at a small native village Lisasa, about 25 kilometers north-west of Kasindi, and he kindly sent me a sketch map with notes showing the locality. Lisasa could not be traced on any large scale modern map, and if it were shown, it was west of the Semliki River, and impossible to reach by road. I could therefore neither trace nor visit the actual type locality, but I did find plants from the Semliki Valley cultivated near Mutsora (Headquarters of the Parc National Albert at the foot of Ruwenzori), and also at a native village Kalindabwiki in the hills south-east of Beni. (Plate XV.) The headman was emphatic that his plants had come from the western side of the Semliki River, about half way to Kasindi, which might be somewhere near the old village of Lisasa.

These plants were flowering, and fitted the description of *A. beniensis*, but they clearly belonged to *A. Dawei*, hence *A. beniensis* also should be reduced to synonymy.

In the mandated territory of Ruanda-Urundi, I found numbers of this shrubby Aloe 4 miles north of Nyanza, and 28 miles north of Astrida, the mountain capital of Ruanda, but they were not flowering on 13th June 1954. Later I called on Mr. Fred L. Hendrickx, Director of the INEAC Station at Mulungu, about 22 miles north-west of Bukavu, near Lake Kivu. Mr. Hendrickx had a large number of plants from Nyanza in cultivation in his gardens at Mulungu, and many were flowering on 18th June 1954. They clearly belonged to *A. Dawei* Berger. (Plate XVI.)

The following description is based on the species as a whole, from personal observations over a wide area:

A. Dawei Berger in *Notizblatt Berl. Bot. Gart.* 4: 246 (1906), in Engler *Pflanzenr.* Liliac.-Aloin. 251 (1908).

—*A. beniensis* De Wild. in *Plant. Bequaert.* 1: 25 (1921).

—*A. Pole-Evansii* Christian in *Fl. Plants S. Afr.* 20: Plate 782 (1940).

Plant succulent (in Sect. *Prolongatae*), forming small to large shrubs, sometimes several metres across.

Stem 6—8 cm. diam., 1—2 met. long, erect or divergent, sublaxly foliate in upper half, old dried leaves persistent below, sometimes decumbent with shoots at random.

Leaves about 16—20, densely rosulate at apex of stems, basally sheathing and laxer downwards, 40—60 cm. long, 6—9 cm. broad at base, gradually tapering to the apex, youngest leaves suberectly spreading, older leaves spreading to recurved; *upper surface* flat low down, canaliculate upwards, olive-green to deep green, sometimes reddish tinged, usually without spots; *lower surface* convex, similar in colour to upper surface and mostly without dull white spots; *margins* sinuate-dentate, armed with deltoid, pungent, reddish-brown teeth averaging 3—4 mm. long (sometimes 5 mm.), 10—15 mm. distant, the interspaces usually rounded. *Sap* dries yellow.

Inflorescence an erect branched panicle 60—90 cm. high.

Peduncle plano-convex and 20—25 mm. broad at base, slenderer and terete upwards, 5—8-branched from about the middle, the lowest branch subtended at base by a broadly ovate-cuspidate bract 12—15 mm. broad, 6 mm. long, thin, scarious, with several nerves.

Racemes subdensely flowered, mostly broadly cylindric-conical, the terminal averaging 10—15 cm. long, 8 cm. diam., the lateral usually a little shorter, the youngest buds denser, suberect, grey-green tipped, older buds spreading, open flowers slightly laxer, subpendulous.

Bracts ovate-acute, thin, scarious, averaging 4 mm. long, 3—5 mm. broad at base, 3-nerved.

Pedicels averaging 14 mm., the colour of the perianth.

Perianth dull scarlet to bright reddish-scarlet, paler at mouth, cylindric-trigonous, averaging 33—35 mm. long, obtusely tapering at base to the articulation, cylindric and 8 mm. diam. across the ovary, thence trigonous and slightly narrowed on underside only, the mouth open; *outer segments* free for 12 mm., paler at the edges, 3-nerved, the apices straight, subacute; *outer segments* free but dorsally adnate to the outer for two-thirds their length, broader than the outer, with 3 congested nerves forming a scarlet keel, the apices brownish-tipped, broader, more obtuse and more spreading than the outer.

Filaments lemon, filiform-flattened, the 3 inner narrower and lengthening before the 3 outer with their *anthers* in turn exserted 3—5 mm.

Style yellow. *Stigma* at length exserted 4—6 mm.

Ovary yellowish-green, 6 mm. long, 3·5 mm. diam.

Material.

Uganda: Buganda, Mengo, near Lake Victoria, Old Entebbe, alt. 3,850 ft., fl. 3 Aug. 1954, Reynolds 7510 (PRE, K, EA.); near Airport north of Old Entebbe, fl. 3 Aug. 1954, Reynolds 7511 (PRE, K, EA.). *Kenya Colony:* 5 miles north-west of Kisumu on road to Yala, alt. 3,850 ft., fl. 8 Aug. 1954, Reynolds 7513 (PRE, K, EA.); 8 miles north-west of Kisumu, fl. 8 Aug. 1954, Reynolds 7515 (PRE, K, EA.); Kisumu, Pole Evans and Erens 1650 and in National Herbarium 25,603 (PRE).

Belgian Congo: Coll. F. L. Hendrickx near Nyanza, Ruanda, cult. INEAC Station Mulungu, fl. 18 June 1954, Reynolds 7263 (PRE, K, BR.); Kivu Prov., Nord Kivu Dist., Semliki River Valley, cult. Kalindabwiki Village, 4,300 ft., fl. 28 June 1954, Reynolds 7274 (PRE, K, BR.); Oriental Prov., Kibali-Ituri Dist., near Marabu, 10 miles east of Irumu, 3,100 ft., fl. 2 July 1954, Reynolds 7279 (PRE, K, BR.).

Distribution.

Uganda: Buganda, Mengo, near Entebbe, near the Airport, at Old Entebbe, Hippo Bay, all near Lake Victoria at about 3,850 ft.; hills near Jinja; Ankole, south bank of the Kazinga Channel, opposite the Mweya Safari Lodge, Queen Elizabeth National Park.

Kenya Colony: Plentiful along the foot of the Nandi escarpment, 2—5 miles north-east of Kisumu on road to Kakamega; abundant for 8 miles north-west of Kisumu along the road to Yala. Flowers July-August.

Belgian Congo: Ruanda-Urundi Territory: near Nyanza about 28 miles north of Astrida; Kivu Prov.; South Kivu Dist., about 4 miles north of Uvira, near Kavimvira and Lake Tanganyika, alt. 2,650 ft.; Kabe, near Lake Kivu. Kivu-North Dist.; Kashero Village, on volcanic rocks near edge of Lake Kivu 4 miles west of Goma, 4,780 ft.; in the Semliki Valley south-east of Beni, also in the Parc National Albert on the Congo-Uganda border. Eastern Province: Kibali-Ituri Dist., in the Ituri forest between Beni and Irumu; on Mbeye hill 6 miles north of Irumu; near Marabu 10 miles east of Irumu at about 3,000 ft.

When growing in small groups, stems average 1 met. and are erect. When in large thickets, stems reach 2 met. and more, especially when supported by bushes. Leaves of young shoots may be copiously white-spotted, the spots usually disappearing with age. Flowers vary little in colour, but the perianth varies from copiously and very minutely white-

spotted to not at all spotted, both forms being found in the same area. Length of perianth varies from 30 mm. in weak forms to 40 mm. in robust forms, about 33—35 mm. being the average.

Native Names.

Kenya Colony: "*Tangaratwet*" in the Nandi tongue of the Nilo-Hamitic Nandi tribe, near Kisumu. Frequently seen planted in rows demarcating fields, especially near Kisumu.

Uganda: "*Kakarutanga*" in the Lutoro tongue of the Batoro tribe of Toro, Western Province.

Belgian Congo: "*Kokorutanga*" in the Kinyoro tongue of the Banyoro, also in the Kihema tongue of the Bahema who are descended from the Banyoro of Uganda. Near Irumu, *A. Dawei* is planted around the flagpole in a chief's village.

Acknowledgments.

I am particularly indebted to Professor V. Van Straelen, President of the Institute of National Parks of the Belgian Congo, Brussels, for granting special authorization to collect Aloe material in the Parc National Albert, and to Mr. Jacques de Wilde, Conservator of the P.N.A. at Mutsora for providing African Rangers to assist in the search for Aloes in the Semliki Valley, and near Beni.

Dr. J. Bequaert, Museum of Comparative Zoology, Cambridge, Mass., U.S.A., for a sketch map and data concerning this and other species which he collected in 1914.

Dr. G. Marlier, Hydrobiologist and Director of I.R.S.A.C. at Uvira, and Madame Marlier, for hospitality and much assistance.

Mr. U. Kinet, Chef de Poste, I.R.S.A.C. Uvira, for considerable assistance investigating the Aloes of the district, and especially for conducting me through a large part of Ruanda-Urundi.

Mr. F. L. Hendrickx, Director of the I.N.E.A.C. Station at Mulungu for sending a large number of Aloe plants of this and other species to Johannesburg from various parts of the Kivu Province and Ruanda-Urundi, and for much assistance when I visited Mulungu.

Mr. Ian Gunn, Works Supervisor of the Queen Elizabeth National Park, Uganda, for taking me across the Kazinga Channel to the locality where he had discovered large numbers of *A. Dawei.*

Mr. P. R. O. Bally, Botanist, Coryndon Museum, Nairobi, for conducting me to Entebbe in April 1952, and for much other assistance.

To the South African Council for Scientific and Industrial Research I am greatly indebted for a travelling grant which enabled me to undertake an expedition through the Belgian Congo to the Sudan and back, investigating the Aloes, of which *A. Dawei* was one.

Fig. 1.

Fig. 2.

Fig. 1. Plants × 1/15 approx., fl. 3 Aug., 1954, near Old Entebbe, Uganda.

Fig. 2. Flowers 1/1 from bud to post-pollination stage.

Plate XIII. *Aloe Dawei* Berger.

Fig. 1.

Fig. 2.

Fig. 1. Plants × 1/18 approx., fl. 8 Aug. 1954, 6 miles north-west of Kisumu, Kenya Colony. (*A. Pole-Evansii* Christian.)

Fig. 2. Flowers 1/1, gathered at random showing variation.

Plate XIV. *A. Dawei* Berger.

Fig. 1.

Fig. 2.

Fig. 1. Plants × 1/20 approx., ex Semliki Valley, cult. near Beni, Belgian Congo, fl. 28 June, 1954. (=*A. beniensis* De Wild.)

Fig. 2. Flowers 1/1, from bud to post-pollination stage.

Plate XV. *A. Dawei* Berger.

Fig. 1.

Fig. 2.

Fig. 1. Plant × 1/15 approx., ex near Nyanza, Ruanda, cult. I.N.E.A.C. Station, Mulungu, north-west of Bukavu, Belgian Congo. Fl. 18 June, 1954. Collected by the Director, Mr. F. L. Hendrickx.

Fig. 2. Flowers 1/1, from bud to post-pollination stage.

Plate XVI. *A. Dawei* Berger.

NOTES ON *ALOE ANGIENSIS* DE WILD., WITH A NEW VARIETY FROM KENYA COLONY.

By G. W. Reynolds.

(With Plates XVII and XVIII.)

Among the 8,000 specimens which Dr. J. Bequaert collected during his Belgian Congo expedition in 1914-15, were five species of Aloe. One of them, *A. angiensis*, was described by De Wildeman in his *Plantae Bequaertianae* 1: 24 (1921)—"Angi, 20 Sept. 1914 (misprinted 1819), J. Bequaert No. 5789, Andropogon grasslands, flowers red."

There were no figures, while the stem (if any) and number of leaves were not stated. De Wildeman has a note that he had only one leaf of *A. angiensis*, and that the collector's notes did not say whether the leaves were unicoloured or maculate in the living state.

The locality Angi, could not be traced on any map I consulted, but fortunately, in November 1953, Dr. Bequaert wrote to me from Cambridge, U.S.A., as follows: "The locality Angi, where I collected *A. angiensis* is (or was in 1914) a very small village about 7 kilometers to the west of Rutshuru, near a small stream, the Kitshuru, flowing into the Rutshuru River. It was a rather low species, with leaves in a rosette close to the ground, each leaf with small white blotches and green borders; flowers red. Altitude of Angi 1,200 met." Dr. Bequaert also kindly furnished me with a rough sketch map showing the locality. Rutshuru is 45 miles north of Goma (which is near Kisenyi on the northern shores of Lake Kivu), in the Kivu Province, Kivu-Nord Dist., Rutshuru Territory, of the Belgian Congo.

On 22 June 1954 I visited Rutshuru for the express purpose of investigating *A. angiensis*. I eventually found many plants in flower on the estate "Hangi", (shown on a large-scale map in the Administrator's office as Angi Angi), 6 miles south-west of Rutshuru, a little south-south-east of Lake Kirwa, and south of the Rutshuru River at c. 1° 13′ S., 29° 25′ E. Large areas of Hangi have now been given over to coffee and banana plantations, but I found numbers of plants on volcanic rocks in rich black volcanic soils, mostly with tall grass.

Plants were variable in leaf markings, branching of the inflorescence, length of pedicels and bracts, and especially in shape, length and colour of flowers. Photographs and herbarium material were secured, and a description drawn up.

I had previously found this species at several localities to the south of Rutshuru, and subsequently found it to the north also, where, near Beni, *A. Bequaerti* De Wild. became involved.

Under *A. Bequaerti*, De Wildeman (l.c. 26) cites: "Beni, 7 April 1914—J. Bequaert no. 3446. Grassy savanna on a rocky hillside; stem 15—20 cm.; leaves watery green with numerous longitudinal lighter coloured markings; inflorescence ¾—1 met. with rosy flowers." There were no figures, but De Wildeman placed this species under *Saponariae—Racemosae* and gave *A. lateritia* Engler as an affinity.

Dr. Bequaert also kindly sent me a sketch he had prepared in 1914 of a flower natural size, and stated: "The plant grew on a rocky hill covered with grass and a few shrubs, about 5 kilometres west of Old Beni. This station was later moved some distance to the west, but the rocky hills must be between the old and the new Beni."

On Monday 28 June 1954 I visited Beni (west of the Semliki River at about 0° 25′ N., 29° 30′ E.) and travelled to Mutsora (east of the river) at the foot of Ruwenzori, specially searching for this species. Old Beni, shown on some maps as Vieux Beni, no longer exists, and now comprises only an air strip. About 3 miles west of Old Beni (about 5 miles south-east of Beni) I found numbers of plants on rocky hill slopes near the Parc National Albert boundary, at or very near where Bequaert must have collected his specimens in 1914. I walked for some distance along the hills and found only this one species of Aloe.

From an examination of those plants, and by comparing material of *A. angiensis* from its type locality at Angi, near Rutshuru, it was clear that they were conspecific. *A. Bequaerti* therefore goes into synonymy under *A. angiensis*.

The following description is based on the species as a whole as observed almost throughout the eastern portion of the Kivu Province:

A. angiensis De Wild. in *Plant. Bequaert.* 1: 24 (1921).

—*A. Bequaerti* De Wild. (l.c.) 26.

Plants (Eualoe, *Saponariae-Racemosae*) acaulescent or with stem up to 20 cm., usually solitary, sometimes in small groups, not seen in dense colonies.

Leaves 16—20, densely rosulate, lanceolate-attentuate, averaging 40 cm. long, 8—9 cm. broad at base, younger leaves erectly spreading, older leaves spreading; *upper surface* flat low down, slightly canaliculate upwards, dull green with numerous obscure "H"-shaped whitish blotches throughout; *lower surface* convex, with paler more obscure blotches throughout, the blotches irregularly scattered, or sometimes arranged in broken transverse bands; *margins* sinuate-dentate, armed with pale brown deltoid

pungent teeth averaging 3—4 mm. long, 10—15 mm. distant. *Sap* dries purplish.

Inflorescence a branched panicle averaging 1·20 met. high.

Peduncle basally flattened and 15—20 mm. diam., averaging 4—6-branched from above the middle, the lowest branch subtended at base by a thin, subscarious, ovate-acuminate 3—5-nerved bract.

Racemes sublaxly flowered, the terminal averaging 20—25 cm. long, 8—9 cm. diam. low down, lateral racemes a little shorter.

Bracts narrowly acuminate, subscarious, 10—15 mm. long, 3—5-nerved, averaging half the length of their pedicels.

Pedicels 20—25 mm. long.

Perianth dull to bright scarlet, averaging 33 mm. long, basally flat or very slightly rounded, inflated to 10 mm. across the ovary, severely constricted to 5—6 mm. above the ovary, thence decurved, laterally compressed and enlarging towards the throat; *outer segments* free for 10—12 mm., paler at margins, 5-nerved, the apices subacute and slightly spreading; *inner segments* themselves free but dorsally adnate to the outer for their greater length, broader than the outer and with more obtuse slightly more spreading apices.

Filaments lemon, filiform-flattened, the 3 inner narrower and lengthening before the outer, with their *anthers* in turn exserted 1 mm.

Style yellow, with *stigma* at length exserted 2 mm.

Ovary green, 8 mm. long, 3 mm. diam.

Material.

Belgian Congo: Kivu Prov., Kivu- Sud Dist., 2 miles east of Kavimvira (6 miles north-east of Uvira) near Lake Tanganyika, alt. 2,700 ft., fl. 11 June 1954, Reynolds 7259 (PRE, K, BR); Kamaniola, 50 miles north of Uvira, 3,100 ft., fl. 16 June 1954, Reynolds 7262 (PRE, K, BR). Kivu-Nord Dist., Hangi (Angi), 6 miles south-west of Rutshuru, alt. 4,200 ft., c. 1° 13′ S., 29° 25′ E., fl. 22 June 1954, Reynolds 7265 (PRE, K, BR); mountain slopes 27 miles north-west of Rwindi, alt. 5,600 ft., fl. 26 June 1954. Reynolds 7269 (PRE, K, BR).

Uganda: Buganda, Mubende, 6 miles east of Mubende, fl. 27 July 1954, Reynolds 7494 (PRE); Buganda, Mengo, 7 miles south of Kampala, fl. 4 August 1954, Reynolds 7512 (PRE, K).

Distribution.

Belgian Congo: Almost throughout the eastern part of the Kivu Province, from 14 miles south-west of Baraka (Burton Bay, Lake Tanganyika) in the south, to beyond Beni in the north. Kivu-Sud Dist.

Near Lake Tanganyika 30 miles south of Uvira; near Uvira; abundant in the Ruzizi Valley east and west of the Ruzizi River especially at mile 19 north of Uvira; mile 21 at Sambiriti, mile 23 at Kabunambo; mile 44 at Luvungi; mile 51 at Kamaniola; for 10 miles up the Kamaniola escarpment; near Lake Kivu north-west of Bukavu, Kalambo, Katana. Kivu-Nord Dist.: Near Rutshuru; near top of Kabasha escarpment at mile 14 north-west of Rwindi at 5,000 ft., mile 27 at 5,700 ft., mile 35 at 5,800 ft., mile 39 at 6,400 ft., not seen above 6,400 ft. At Ishango, on north bank of the Semliki River near Lake Edward; hills south-east of Beni, and north of Beni.

Uganda: Buganda, Mengo, between Kampala and Entebbe; between Kampala and Mubende; between Mubende and Fort Portal. Toro: At Mweya Safari Lodge in the Queen Elizabeth National Park, near Lake Edward. *A. angiensis* probably occurs all around the base of the Ruwenzori massif.

Native Names.

Belgian Congo: "*Kidata*" in the Kivira tongue of the Bavira tribe of Uvira; "*Ngagare*" in the Kirundi tongue of the Barundi tribe of Urundi. (The leaves are cut, soaked in water and used as a remedy for worms.) "*Ngaka*" in the Bashu tongue used in the Semliki Valley near Mutsora, Parc National Albert Headquarters.

A. angiensis De Wild. var. **kitaliensis** Reynolds. Varietas nova, a forma typica in racemis longioribus densioribus cylindrico-acuminatibus, gemmis densioribus, pedicellis brevioribus, bracteis longioribus et perianthio basin minus inflato, differt.

Kenya Colony: 6 miles south-east of Kitale, alt. 6,300 ft., fl. 11 Aug. 1954, Reynolds 7520, holotype (PRE), isotypes (K, EA); 1 mile south-east of Kitale, alt. 6,400 ft., fl. 11 Aug. 1954, Reynolds 7519 (PRE, K).

The variety differs from the typical form in having slightly longer, narrower, denser cylindric-acuminate racemes, denser buds, longer narrowly deltoid bracts as long as their pedicels, shorter pedicels averaging 16 mm. long, dull flesh-pink flowers, and 35 mm. perianth with less inflated subglobose basal swelling.

Plants were found in numbers near Kitale; on the Kitale-Endebess-Mt. Elgon road; on the Kitale-Elgon link road; on the Kitale-Turbo road; repeatedly along the Kitale-Hoey's Bridge road; occasional near Soy and Eldoret. A form with more acuminate racemes occurs in numbers each side of the Kipkarren River about 11 miles south-west of Eldoret on the road to Kapsabet, flowering early in August.

The variety occurs as solitary plants, not suckering and forming groups, and was observed mostly in grasslands with or without bush, in deep soils.

Description. *Plants* solitary, acaulescent or with very short stem.

Leaves about 16, densely rosulate, lanceolate-attenuate, about 40 cm. long, 7—9 cm. broad, the youngest erectly spreading, oldest spreading and slightly recurved in upper fifth; *upper surface* dull watery-green with numerous greenish-white spots or blotches throughout, the blotches varying from obscurely lenticular to "H"-shaped, scattered or sometimes arranged in irregular transverse bands; *lower surface* convex, paler green, with fewer blotches; *margins* sinuate-dentate, armed with deltoid pungent pale-brown teeth averaging 3—4 mm. long, 10—15 mm. distant. *Sap* dries yellow.

Inflorescence a branched panicle 1·1—1·3 met. high.

Peduncle plano-convex and 25 mm. broad at base, green with a grey powdery bloom, 4—8-branched from the middle or higher.

Racemes cylindric-acuminate, subdensely flowered, the terminal the highest and 20—25 cm. long, 8 cm. diam., the buds suberect, crowded, older buds spreading, open flowers subpendulous.

Bracts narrowly deltoid-acuminate, 3 mm. broad at base, as long as the pedicel.

Pedicels averaging 16 mm. long, with apices nutant.

Perianth flesh pink, averaging 35 mm. long, subglobosely inflated at base and averaging 8—9 mm. diam. across the ovary, constricted to 5—6 mm. above the ovary, thence decurved and enlarging towards the throat; *outer segments* free for 8 mm., with paler margins, obscurely nerved, the apices subacute, slightly spreading; *inner segments* broader than the outer and with more obtuse more spreading apices.

Filaments lemon, filiform-flattened, the 3 inner narrower and lengthening before the 3 outer with their *anthers* in turn exserted 0—2 mm.

Style yellow, with *stigma* at length exserted 2—3 mm.

Ovary 8—9 mm. long, 3½ mm. diam., green.

Acknowledgment.

I am indebted to the South African Council for Scientific and Industrial Research for a travelling grant which enabled me to investigate the Aloes of Tropical Africa. *A. angiensis* was one of them.

Fig. 1.

Fig. 2.

Fig. 1. Plants × 1/12 approx., fl. 22 June, 1954, at the type locality, Angi, 6 miles south-west of Rutshuru, Kivu Nord Dist., Belgian Congo.

Fig. 2. Flowers 1/1, gathered at random, showing variation.

Plate XVII. *Aloe angiensis* De Wild.

Fig. 2.

Fig. 1. Plant × 1/12 approx., fl. 11 Aug., 1954, near Kitale, Kenya Colony.

Fig. 2. Flowers 1/1 from bud to post-pollination stage.

Fig. 1.

Plate XVIII. *A. angiensis* De Wild. var *kitaliensis* Reynolds.

THE IDENTITY OF *ALOE SERETI* DE WILD.

By G. W. Reynolds.

(With Plates XIX and XX.)

This was one of the five species of Aloe collected by Dr. J. Bequaert in 1914 in the Belgian Congo. It was described by De Wildeman in his *Plantae Bequaertianae* 1: 28 (1921). Two localities were given: Irumu, 2 July 1914, (J. Bequaert No. 4893—grassy savanna, on rocks, flowers carmine-red); and "Route between Bo and Gongo, 28 October 1905, F. Seret No. 299." No type is stated.

Professor W. Robyns, Director of the Jardin Botanique de l'Etat, Brussels, informed me that Seret 299 is the type, and that the type locality is near Amadi, west of Niangara, in the Uele District.

There were no figures, and the description does not give the size of the plant, the number of leaves, or their markings if any.

Irumu is in the Oriental Province, Kibali-Ituri District, of the Belgian Congo, about 60 miles west of Lake Albert (Kasenyi), on the south bank of the Shari River, at about 1° 20′ N., 29° 50′ E., alt. 3,100 ft.

Before leaving on my Congo-Sudan expedition I communicated with Dr. Bequaert, who kindly informed me that "*A. Sereti* grew on rocks in a grass-savanna (mostly Andropogon), 2 hours walk north of Irumu. This was an acaulescent species, with leaves in a rosette, leaves green without blotches. The locality "2 hours walk north of Irumu" was on a pathway serving as a road in 1914 between Irumu and Kilo, and about halfway between Irumu and a village called Pania." Dr. Bequaert also kindly sent me a sketch he had made in 1914, of a flower with pedicel and bract, natural size.

On 2 July 1954 I arrived in Irumu and succeeded in tracing the old track to Pania village. Crossing the Shari River, and walking northwards up hill and down dale for two hours along the old Pania footpath, I eventually reached a granite hill known to local natives as "Mbeye", where numbers of Aloes were found, many being in flower. The distance north of Irumu would be 6—7 miles. This was clearly Dr. Bequaert's locality, and flowers matched his sketch.

Photographs were secured, herbarium material gathered, and a full description drawn up on the spot. (On a nearby hilltop, *A. Dawei* Berger= *A. beniensis* De Wild. was also found.)

The following day I journeyed eastwards to Bunia, thence north-eastwards along the road to Nioka. I found the species again half a mile south-

west of Chief Libi's village which is 8 miles north-east of Fataki and 14 miles south-west of Nioka Post Office, at 5,800 ft., on granite. At this locality plants were mostly in bud on 4 July 1954, but a few were found in flower. Bracts were larger and more fleshy, and young buds were entirely hidden by densely imbricate bracts. Herbarium material was gathered at this locality also.

Four miles north-east of Libi's village (10 miles south-west of Nioka) large numbers were again seen on granite.

Near Adranga, and along the Congo-Sudan border, a closely allied but distinct species, *A. Schweinfurthii* Bak., takes over.

The following description is based on plants near Bunia and near Fataki:

A. Sereti De Wild. in *Plantae Berquaertianae* 1: 28 (1921).

Stem none or short, suckering from base and forming small to large dense groups on rocks.

Leaves about 16, densely rosulate, erectly spreading, with upper quarter recurved and with a twist, lanceolate-attenuate, averaging 40 cm. long, 6—7 cm. broad at base; *upper surface* flat low down, canaliculate upwards, grey bluish-green with a reddish tinge, mostly without spots, sometimes obscurely dull white-spotted; *lower surface* convex, similar in colour to upper surface, mostly without spots; *margins* sinuate-dentate with pinkish edge, armed with pungent deltoid teeth which are white at base and reddish brown-tipped, averaging 3—4 mm. long, 8—10 mm. distant, more crowded near base of leaf, more distant upwards, the interspaces rounded.

Inflorescence a sparsely branched panicle 60—70 cm. high.

Peduncle brown, minutely speckled, flattened and 15 mm. diam. at base, mostly compactly 3-branched from the middle or lower (sometimes 4-branched), the lowest branch subtended at base by a broadly ovate-acute subscarious many-nerved bract 25 mm. broad, 12 mm. long.

Raceme cylindric-conical, 15—20 cm. long, 5—6 cm. diam., subdensely flowered, the apical buds covered by densely imbricate bracts, older buds grey-green tipped and horizontally disposed, the open flowers subpendulous.

Bracts ovate-acute, pink, rather fleshy, varying from 9—15 mm. long, and from 5—10 mm. broad, with 3—5 pinkish nerves.

Pedicels nutant at apex, 14—18 mm. long, the colour of the perianth.

Perianth dull to bright scarlet, cylindric-trigonous, 28—33 mm. long, obtusely tapering at base and shortly stipitate, 7 mm. diam. across the ovary, thence very slightly narrowed on underside only, the mouth wide open; *outer segments* free for 9—10 mm., obscurely nerved, the apices

subacute; *inner segments* themselves free but dorsally adnate to the outer for two-thirds their length, broader than the outer, scarlet-keeled, and with more obtuse more spreading apices.

Filaments pale rose turning lemon near the mouth, the 3 inner narrower and lengthening before the 3 outer, with their *anthers* in turn exserted 1—3 mm.

Style pale yellow, with *stigma* at length exserted 3—4 mm.

Ovary green, 5 mm. long $2\frac{1}{2}$ mm. diam.

Material.

Belgian Congo: Oriental Province, Kibali-Ituri Dist., on Mbeye hill, 2 hours' walk north of Irumu on old track to Pania village, fl. 2 July 1954, Reynolds 7280 (PRE, K, BR, EA); near Chief Libi's village 8 miles north-east of Fataki (14 miles south-west of Nioka P.O.), fl. 4 July 1954, Reynolds 7281 (PRE, K, BR).

Key.

A. Sereti De Wild., *A. Schweinfurthii* Bak. (from the Congo-Sudan border), and *A. mubendiensis* Christian (from the Toro district of western Uganda), comprise a natural group of three closely allied species.

These three species were found only on rocks, in crevices and shallow pockets of soil, while in habit of growth and leaf characters they are scarcely separable. In inflorescence characters they can be distinguished as under:

Inflorescence 60—70 cm., 3-branched, racemes with youngest buds covered by densely imbricate bracts	*A. Sereti.*
Inflorescence 90 cm., 8—10-branched, racemes more laxly flowered, all buds visible, bracts smaller and not imbricate	*A. Schweinfurthii.*
Inflorescence with about 8 subobliquely spreading branches, racemes 8—10 cm. with flowers slightly secund, bracts very small	*A. mubendiensis.*

Native Name.

Abungubete (Amadi) *fide* De Wildeman.

Acknowledgment.

I am indebted to the South African Council for Scientific and Industrial Research for a travelling grant which enabled me to investigate many of the Aloes of Tropical Africa. *A. Sereti* was one of them.

Fig. 1.

Fig. 2.

Plate XIX. *Aloe Sereti* De Wild.

Fig. 1. Plants 6—7 miles north of Irumu, Belgian Congo, fl. 2 July, 1954, × 1/10 approx.
Fig. 2. Flowers 1/1 from bud to post-pollination stage.

Fig. 1.

Fig. 2.

Fig. 1. Plant × 1/10 approx., fl. 4 July, 1954, 8 miles north-east of Fataki, 14 miles south-west of Nioka, Belgian Congo.

Fig. 2. Flower with pedicel and bract 1/1.

Plate XX. *A. Sereti* De Wild.

INDEX OF PLANT NAMES